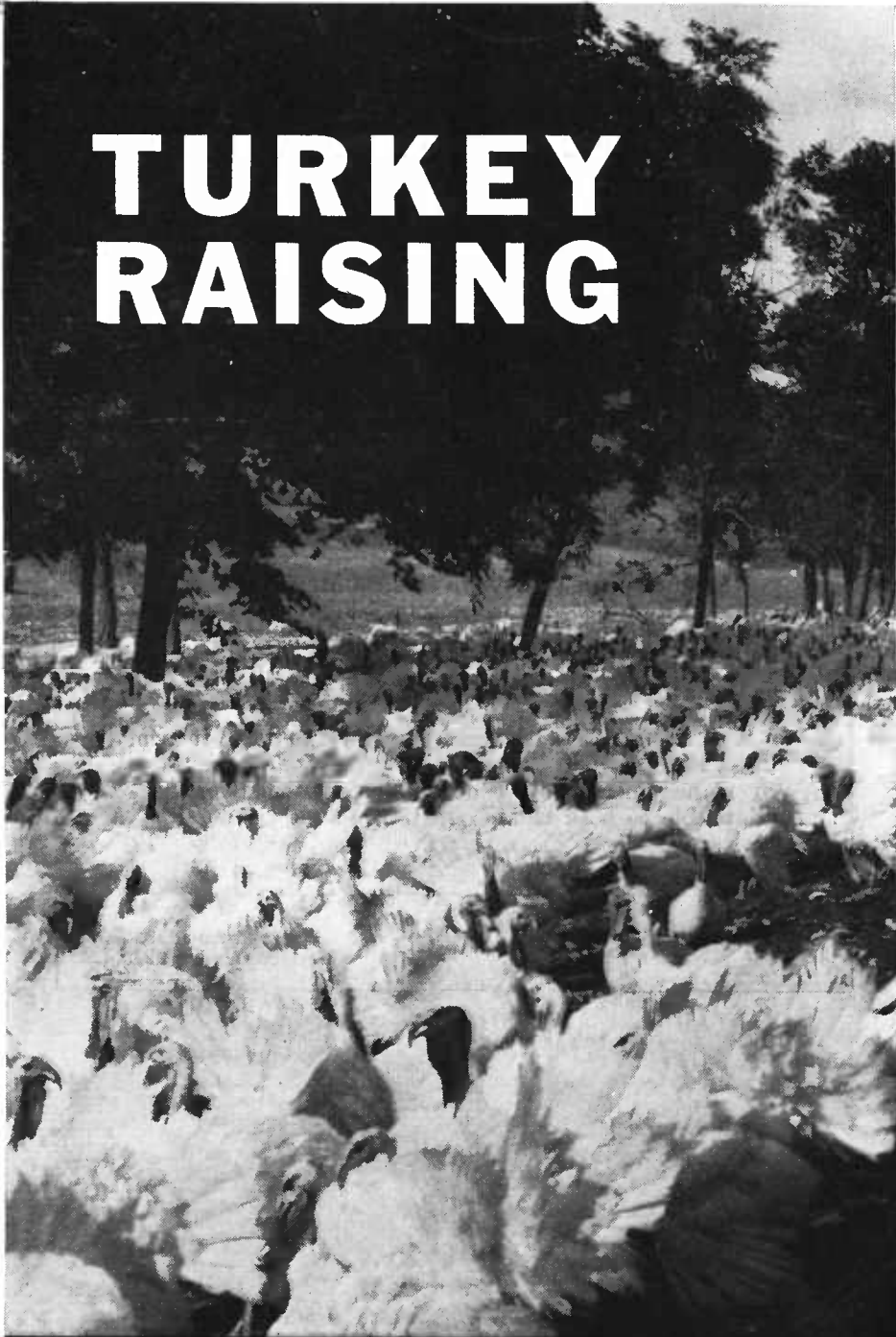


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TURKEY RAISING



Farmers' Bulletin No. 1409
U. S. DEPARTMENT OF AGRICULTURE

TURKEY RAISING is widely carried on as a side line on general farms, though in some localities of the United States it constitutes the chief source of revenue from farming.

The number of turkeys in this country decreased for a time after the 1890 census, but during recent years the industry has been growing, largely because of improved methods of controlling turkey diseases and better methods of management, as well as better marketing methods.

This bulletin has been prepared primarily to inform those interested in turkey raising on modern methods of management. Most of the recommendations are adaptable to both small- and large-scale production.

Washington, D. C.

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TURKEY RAISING

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¹ This is a revision of former editions by M. A. Jull, A. R. Lee, and Stanley J. Marsden.

THE TURKEY INDUSTRY OF THE UNITED STATES

TURKEY RAISING has long been an important and profitable farming operation in the United States. The important areas of production now are the Middle West, the Pacific Coast, and the Middle Atlantic States where large numbers of small- and medium-sized flocks, as well as many large commercial flocks, are raised annually on farms and ranches. Up to 60,000 turkeys have been raised on one farm in a season and 10,000 to 20,000 are not uncommon. Usually, however, not more than 5,000 are reared in one flock, and flocks of 1,500 to 2,500 are popular sizes in commercial enterprises.

The number of turkeys in this country began to decrease in the nineties and remained at a low figure until the twenties when interest in turkey raising revived. In recent years the industry has been growing rapidly, largely as a result of increased knowledge of feeding, management, disease control, and an increasing demand for turkey meat throughout the year.

According to the census, there were 10,754,060 turkeys in the United States on June 1, 1890 and 6,594,695 on June 1, 1900. On April 15, 1910, there were 3,688,708 adult turkeys on hand, and on January 1, 1920 there were 3,627,028. The Bureau of Agricultural Economics estimated that 18,476,000 turkeys were raised in 1929, 22,333,000 in 1932, 20,821,000 in 1935, 26,887,000 in 1938, 33,587,000 in 1939, 34,047,000 in 1940, 32,902,000 in 1941, 32,805,000 in 1942, 32,309,000 in 1943, 35,616,000 in 1944, 44,221,000 in 1945, 40,724,000 in 1946, and 34,970,000 in 1947. A further decrease to about 31,793,000 was indicated for 1948 with prospects for 41,107,000 in 1949.

Gross income from turkeys in the United States reached \$273,724,000 in 1946, the peak year in value of the crop. The 1948 crop, although relatively small, produced a high gross income of \$260,685,000. The record production of 1945 produced a gross income of \$249,029,000. Estimates of breeder hens on hand January 1 were as follows: 1946, 5,241,000; 1947, 4,222,000; 1948, 2,771,000. The preliminary estimate for January 1, 1949 was 3,689,000.

In 1945, the peak year of turkey production, the 10 leading States and number of birds raised were: (1) California, 5,762,000; (2) Texas, 4,701,000; (3) Minnesota, 3,979,000; (4) Oregon, 3,105,000; (5) Iowa, 2,890,000; (6) Utah, 2,036,000; (7) Missouri, 1,838,000; (8) Washington, 1,533,000; (9) Pennsylvania, 1,460,000; and (10) Virginia, 1,232,000. In 1946, the peak year for keeping of breeding stock, the States leading in number of breeder hens on hand January 1, 1946, were: (1) California, 899,000; (2) Texas, 774,000; (3) Oregon, 433,000; (4) Minnesota, 380,000; (5) Missouri, 335,000; (6) Ohio, 175,000; (7) Virginia, 151,000; (8) Illinois, 144,000; and (9) and (10) Iowa and Kansas, 141,000 each.

Where conditions are suitable and proper methods of management are followed, turkeys can be raised successfully with relatively little equipment, therefore the capital outlay in the enterprise may be small. The flock must be kept relatively free from disease and the soil, especially near feeders and waterers, must be kept sanitary. Moreover, turkeys even when well fed will make good use of range and in doing so will destroy many injurious insects, eat great quantities of succulent green feed, and pick up much waste grain, weed seeds, and other sources of nutriment.

The National Turkey Improvement Plan, administered by the U. S. Bureau of Animal Industry in cooperation with official State agencies, is a program designed to improve the quality of turkeys through selection, pedigree breeding, and disease control. Turkey breeders who are cooperating in this plan are likely to have turkeys of good quality. Information concerning the plan may be obtained from the U. S. Department of Agriculture, Beltsville, Md.

VARIETIES

There are only two species of turkeys now living in the world. One is the beautiful ocellated or Yucatan turkey, *Agriocharis ocellata*, which rivals the peacock in brilliance of plumage. It inhabits the tropical forests of southern Mexico and Central America and so far as can be determined never has been domesticated. The other species is the North American wild turkey, *Meleagris gallopavo*, from which all domesticated turkeys have descended. There are five recognized subspecies of this latter species as follows: (1) The eastern wild turkey (fig. 1), which ranged over the eastern half of the United States

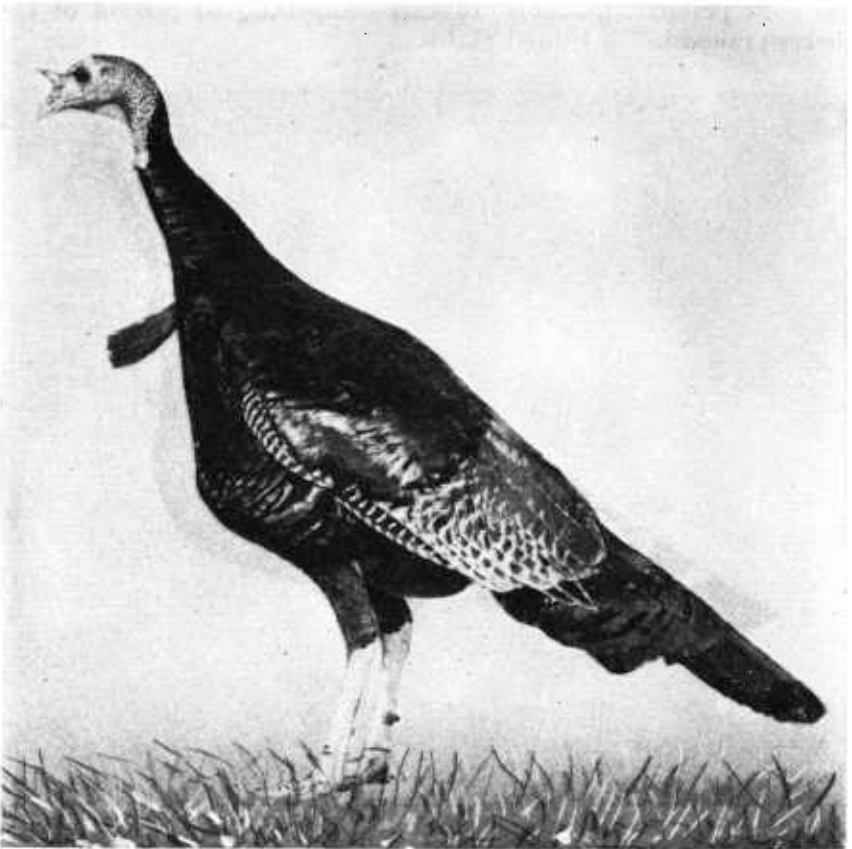
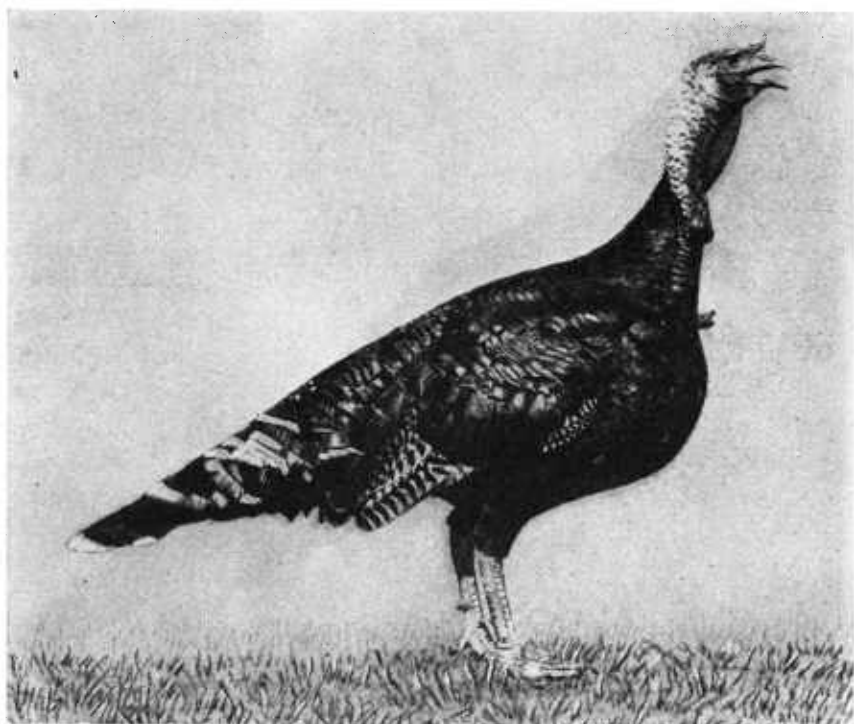


Figure 1.—Eastern wild turkey tom raised in captivity.

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from Maine to Florida, westward to eastern Texas; and northward to Canada; (2) the Florida wild turkey which ranged over the southern two-thirds of Florida; (3) the Rio Grande wild turkey, which ranged over southern Texas and northeastern Mexico; (4) Merriam's turkey, which inhabited Arizona, New Mexico, southern Colorado, western Texas, and northwestern Mexico; and (5) the Mexican wild turkey, which ranged over central Mexico.

Six standard varieties, popularly called breeds, of domesticated turkeys are recognized by the American Poultry Association, an organization having as its primary function the standardizing of varieties of poultry in North America. The Association publishes the Standard of Perfection, which contains concise descriptions of breeds and varieties of poultry with illustrations of some of them. The six standard varieties of turkeys are Bronze, White Holland, Bourbon Red, Narragansett, Black, and Slate. The nonstandard varieties are Broad Breasted Bronze, Beltsville Small White, Royal Palm, Wild, Jersey Buff, and the Charlevoix, a small-type Bronze turkey originating in Canada. Of all these varieties the Broad Breasted Bronze, standardbred Bronze, and crosses between them are by far the most popular, probably together comprising 90 percent of the turkeys raised in the United States.



76255-B

Figure 2.—Standardbred Bronze male. Note strong upright carriage. This bird weighed 21½ pounds at market age, 6½ months.

STANDARD VARIETIES

The Bronze

The Bronze is the heaviest standard variety. The standardbred male (fig. 2) is distinguished by (1) the rich iridescent red-green sheen of the plumage on the neck, wing bows, wing fronts, secondary wing coverts, breast, front half of the back, and lower thighs, all feathers except those on the neck and upper breast being bordered with black; and (2) the lighter, brilliant, copper-colored bronzing on the rear half of the back, tail coverts, tail itself, and upper thighs. The bronzing in the tail, tail coverts, and upper thighs is bordered front and rear by a distinct narrow black band which in turn is bordered by a wide terminal edging of pure white. The rear portion of the back has the broad bronze bar with the narrow edging of black, but does not have the white tips. The beard is black.

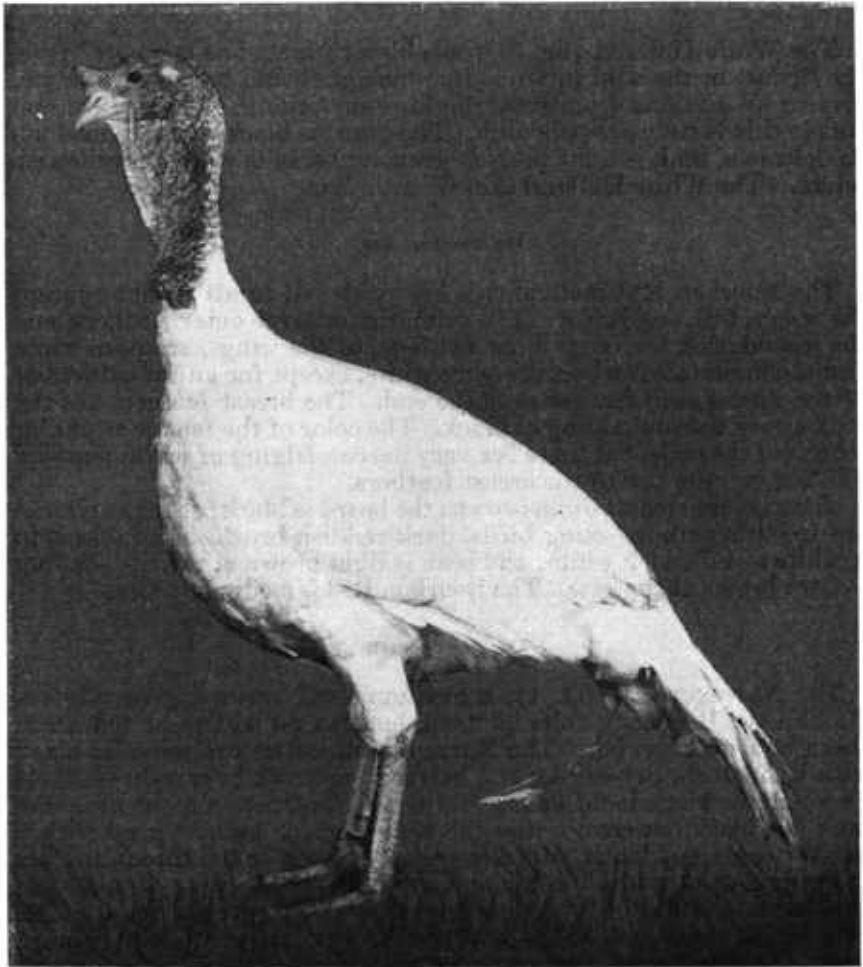


Figure 3.—White Holland tom.

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The plumage of the Bronze female is similar to that of the male, except for an edging of white on the black bars of the back, wing bows, secondary wing coverts, and breast. This white edging is narrow in the front of the body and gradually widens toward the rear. Both sexes have black undercolor in all sections and the same color pattern in the large wing feathers and in the main tail feathers and coverts. The main tail feathers and coverts have brown penciling (narrow bars) on a dull black background; the large wing feathers, primaries and secondaries, are evenly barred with black and white, the bars of the secondaries becoming indistinct as the back is approached. In both sexes, the beak is brownish yellow at the tip, shading to brownish black at the base; the eyes are medium dark brown; shanks are almost black in young birds and pinkish black in adults; and the skin is creamy white, or yellowish white if pigment-producing feeds such as yellow corn are eaten in large quantities.

The White Holland

The White Holland (fig. 3) probably originated as a "sport" from the Bronze or the wild turkey. Its plumage should be pure white and free in all sections from black flecking or ticking. The shanks and toes in this variety are pale pink. The beard is black, eyes are medium dark brown, beak is light pinkish gray, and skin is white or yellowish white. The White Holland is medium in size.

The Bourbon Red

The Bourbon Red male is rich brownish red in all sections except the wings, tail, and breast. The primaries or large outer feathers, and the secondaries, the large inner feathers, of the wings, are pure white and the main tail feathers are pure white, except for an indistinct bar of red across each feather near the end. The breast feathers are red with a very narrow edging of black. The color of the female is similar to that of the male, but there is a very narrow edging of white (instead of black) on the tips of the breast feathers.

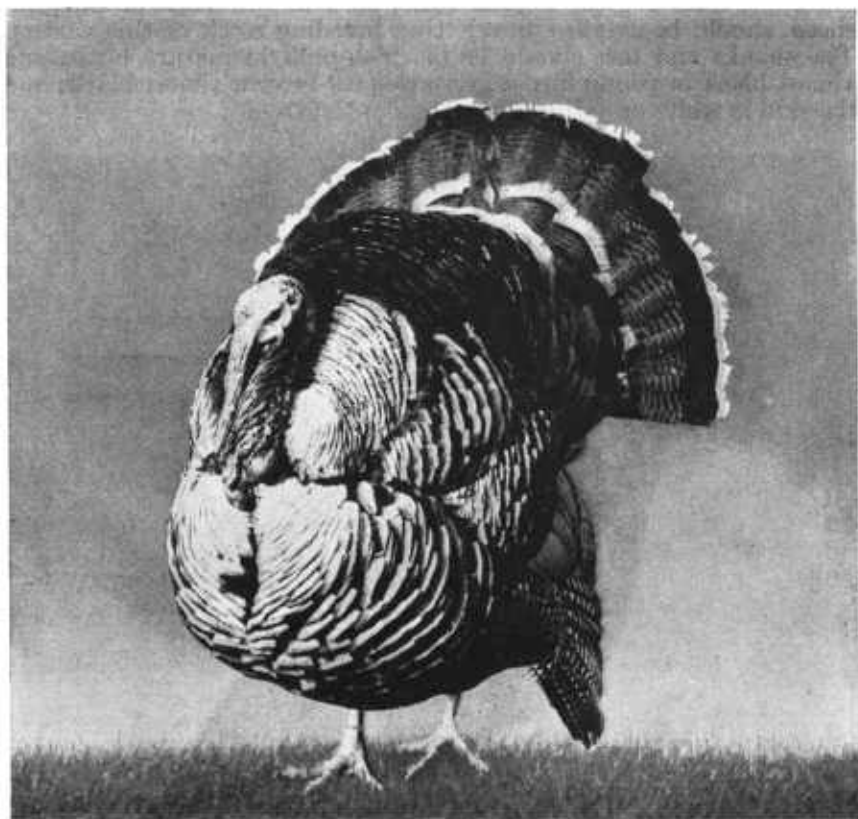
The eyes are rich medium brown; the beard is black; shanks and toes are reddish pink in young birds, dark reddish brown in adults; skin is white to yellowish white; and beak is light brown at the tip, shading to dark brown at the base. The Bourbon Red is medium in size.

The Narragansett

The Narragansett (fig. 4), a medium-sized variety, generally resembles the Bronze in color pattern, but has no iridescent red-green sheen and no bronzing. The Narragansett colors are metallic black with light steel-gray edging and barring bordered, in certain sections, by a narrow black band on the end of the feathers. In the male the neck has black undercolor and the surface color is light gray with a narrow edging of black, which is very narrow near the throat and becomes broader toward the back. The colors of the wing front, wing bow, and secondary coverts are like those of the neck, but there is little or no black undercolor and the gray portion is much wider so that the general appearance is gray with black edging. The gray of the secondary coverts forms a broad silvery bar across the folded

wings. The breast has black undercolor and light gray surface color which has a black edging, narrow near the front and broader toward the rear, the gray becoming darker in the rear portion.

The back is rich metallic black free from bronzing. The saddle feathers are black with broad silvery gray tips. The body feathers which include those of the thigh proper, are black ending in a broad silvery gray band tipped with black. The feathers of the fluff and lower thighs (drumsticks) are black with light edgings. The large wing feathers, the primary coverts, and the pinion feathers (the short, stiff feathers on the thumb of the wings) are barred evenly with black and white as in the Bronze, the barring of the upper secondaries becoming indistinct as the back is approached. The main tail feathers and greater and lesser tail coverts are evenly penciled, a medium shade of tan on black, and have broad black tips broadly edged with white.



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Figure 4.—Narragansett tom. Weight at market age, 28 weeks, 19 pounds.

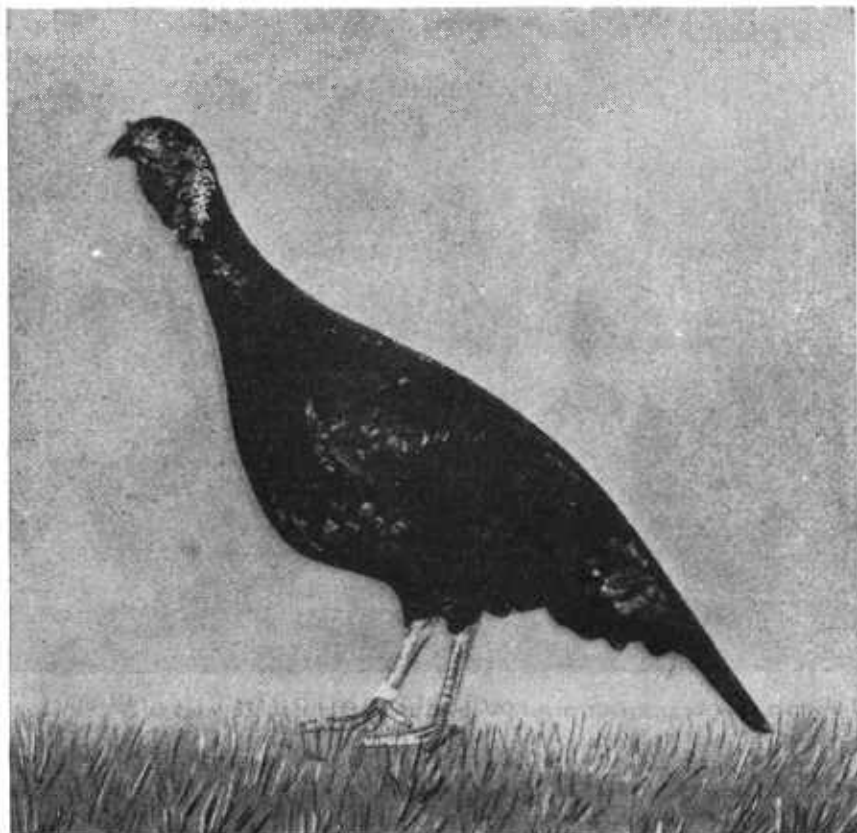
The plumage of the female is similar to that of the male, except that an edging of white is added to the black tips of the feathers on the wing bows, back, and breast. The light edging is narrow toward the front of the bird and broader toward the rear. The main tail feathers and the greater and lesser tail coverts usually are a lighter

shade of tan than those in the male. Owing to the white edging on wings, back, and breast, the female appears lighter-colored than the male.

The eyes are medium dark brown, the beak is horn-colored (bluish gray), beard is black, shanks and feet in grown birds are medium pinkish brown; in young birds, somewhat darker. The skin is white or yellowish white as in the other varieties. Young Narragansett poultts resemble Bronze poultts and cannot be distinguished from them.

The Black

The Black is a medium-sized variety (fig. 5) known in England as the Norfolk turkey. The plumage is lustrous greenish-black in all sections. Objectionable white tipping in the feathers of young turkeys of this variety usually disappears after the first juvenile molt. Any variation from the solid-black color, such as brownish or purplish sheen, should be avoided in selecting breeding stock of this variety. The shanks and toes should be blackish-pink in mature birds, and almost black in young birds; eyes are dark brown, almost black; and the skin is white or yellowish white.



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Figure 5.—Black turkey hen. Weight at market age, 28 weeks, 12½ pounds.

The Slate

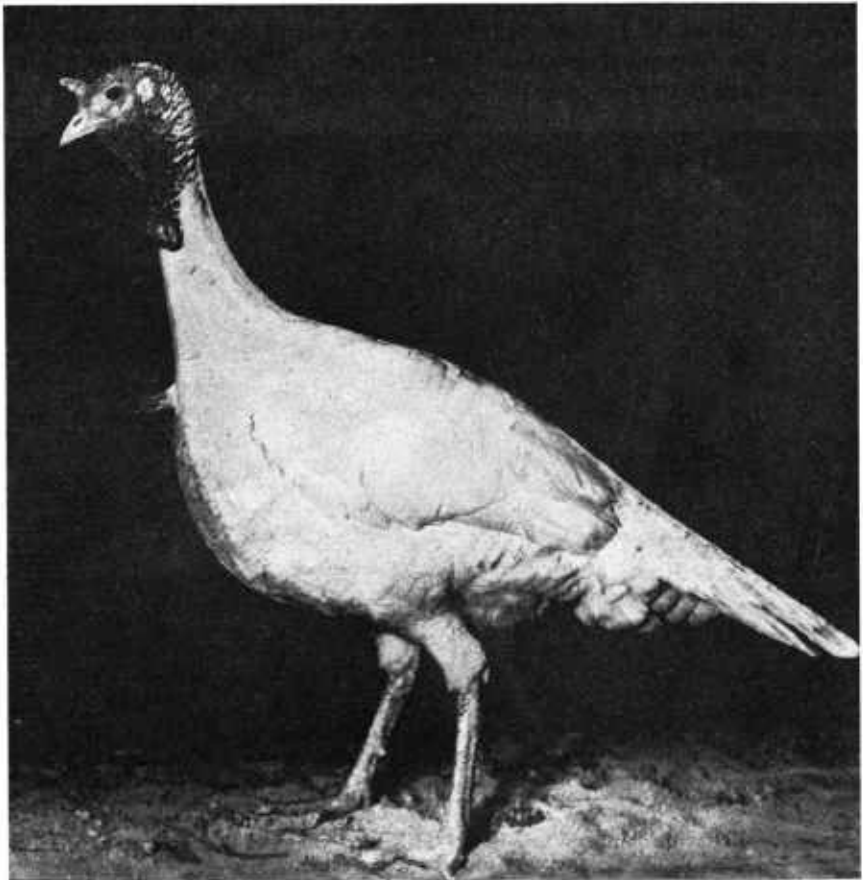
The Slate turkey is described as having clear slate-colored plumage. However, some white and reddish colors are unavoidable, these colors appearing in the plumage where the Bronze has them. Shanks and toes should be pink, the beak pale bluish gray, the eyes medium dark brown, and the beard black.

NONSTANDARD VARIETIES

Admission of a variety to the Standard is a matter of promotion by the breeders of it. Actually the great majority of turkeys now raised in the United States are of the nonstandard varieties, the Broad Breasted Bronze and the Beltsville Small White being outstanding examples.

The Jersey Buff

The plumage of Jersey Buff turkeys is usually a clear, uniform medium shade of reddish buff in all sections except the breast of males in which the feathers are narrowly tipped with black, and the breast

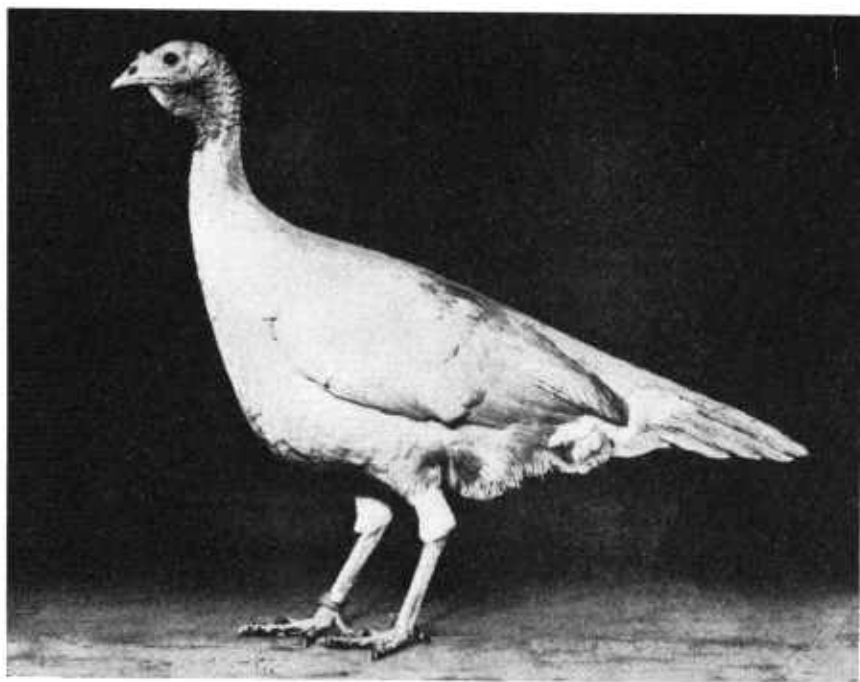


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Figure 6.—Beltsville Small White tom. This bird weighed $14\frac{1}{2}$ pounds at market age, $5\frac{1}{2}$ months (24 weeks).

of females in which the feather tips have a narrow edging of white. However, the primary wing feathers usually are mostly white, the secondaries partly white, and the tail chiefly white with an indistinct bar of buff near the end. The undercolor should be clear buff but usually has considerable gray, shading to a whitish color near the skin. These color conditions are normal and acceptable in the Jersey Buff. However, there is a strong tendency toward undesirable black color in the surface plumage of both sexes, especially the males, and undesirable white color in the surface plumage, particularly of the back and wings of females. These serious defects should be guarded against in breeding Buffs.

Eye color is almost black as in the Black variety; and legs and toes tend to be reddish black. The Jersey Buff variety was developed through pedigree breeding and selection from crosses of Black, Bourbon Red, and Broad Breasted Bronze, at the New Jersey Turkey Experiment Station, Millville, N. J. It is medium small in size averaging about 10 percent heavier than the Beltsville Small White at all ages (table 1). At market age for males, 28 weeks, the toms average about 19.4 pounds (alive); at market age for females, 26 weeks, the hens average about 10.5 pounds. The light-colored pinfeathers are inconspicuous in the dressed bird.



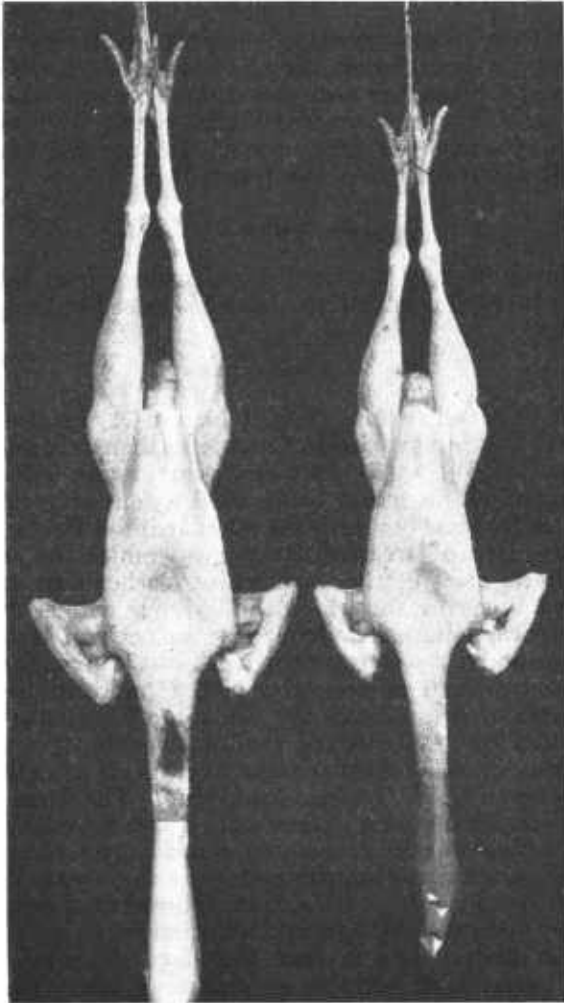
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Figure 7.—Beltsville Small White hen. This bird weighed $8\frac{3}{4}$ pounds at market age, $5\frac{1}{2}$ months (24 weeks).

The Beltsville Small White

The Beltsville Small White turkey (figs. 6, 7, and 8) was developed through pedigree breeding and selection by the U. S. Department of Agriculture at the Agricultural Research Center, Beltsville, Md., from crosses of standardbred Bronze, small-type Canadian (Charlevoix) Bronze, Broad Breasted Bronze, Black, wild turkey, White Holland, Narragansett, and White Austrian varieties. It is identical in color with the White Holland but is smaller, the young toms and hens both being of a size in demand by the retail trade.

In body type, it is well fleshed, particularly on the breast, and matures for market 2 to 4 weeks earlier than the larger varieties, reaching market age in 22 to 26 weeks, or when the toms average 13 to



76132-B

Figure 8.—Typical Beltsville Small White turkey carcasses of U. S. Grade A at 24 weeks of age. The male (left) weighs 12½ pounds dressed, the female, 7½.

16 pounds alive, and the hens 8 to 9½ pounds. Toms and hens mature at the same age. As with other white varieties, the Beltsville Small White dresses out well for market, as white pinfeathers are inconspicuous. It is no different from other varieties in livability, susceptibility to disease, and in requirements for feeding and management.

When given access to green range it will produce a pound of live turkey meat in a 24-week growing period on about 4.6 pounds of feed. This is about the same as that required by flocks of the standard varieties and only about 0.2 pound more than the amount required by flocks of Broad Breasted Bronze to produce a pound of live turkey in a 28-week growing period. About one-fifth to one-fourth more small-type turkeys may be raised with the same equipment and labor.

The Royal Palm

The Royal Palm, a new variety, is a white to silvery white turkey with white to light-gray undercolor and with black on the back, wings, and breast, and a black bar near the end of the tail. Legs are light salmon in color and eyes are medium dark brown. The beak is bluish-gray and the eyes medium dark brown. In size, the Royal Palm is medium small, about the size of the Jersey Buff.

The Charlevoix

The Charlevoix turkey is a small-type Bronze about the size of the Jersey Buff. It originated in Canada and is raised in limited numbers in that country.

The Broad Breasted Bronze

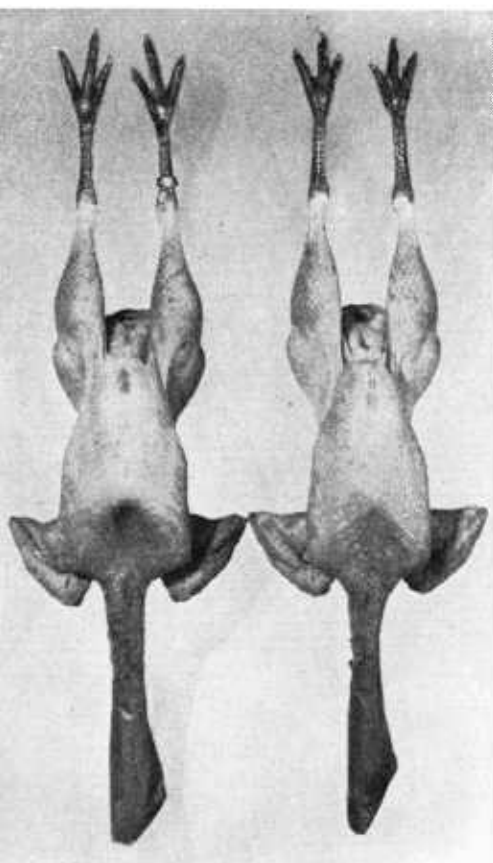
The Broad Breasted Bronze (figs. 9, 10, and 11) originated in England whence it was imported into Canada in the twenties; then about 1935, into the United States. In a few years, it has become the most widely grown of all varieties, being used extensively in pure blood lines as well as for crossing with the standardbred Bronze.

In color the Broad Breasted Bronze resembles the standardbred Bronze but lacks most of the pure white feather tips and the rich, copper-colored bronzing for which the latter is noted. It is in body type that the Broad Breasted Bronze is distinctive. It is larger and has a better muscular development which gives it an extremely plump appearance and a yield of around 6 pounds more of lean meat per hundred pounds of dressed carcass. In rate of maturity, it is about equal to the standardbred Bronze, the toms requiring, under average conditions, from 28 to 30 weeks with an average of 28 under favorable conditions to reach U. S. Grade A condition. The hens, as with the standard varieties, reach market maturity about 2 weeks ahead of the toms under favorable conditions. In reproductive ability, it is inferior to most other varieties, producing on the average fewer eggs, which are less fertile and less hatchable. However, this condition can be corrected by pedigree breeding and selection for balance and reasonable length of body. The present Standard description for body shape of all varieties of turkeys, emphasizing heavy fleshing in all sections, especially in the breast and legs, may be applied to the Broad Breasted Bronze as well as to the standard varieties.



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Figure 9.—Good type of Broad Breasted Bronze breeding hen, with well-balanced body.



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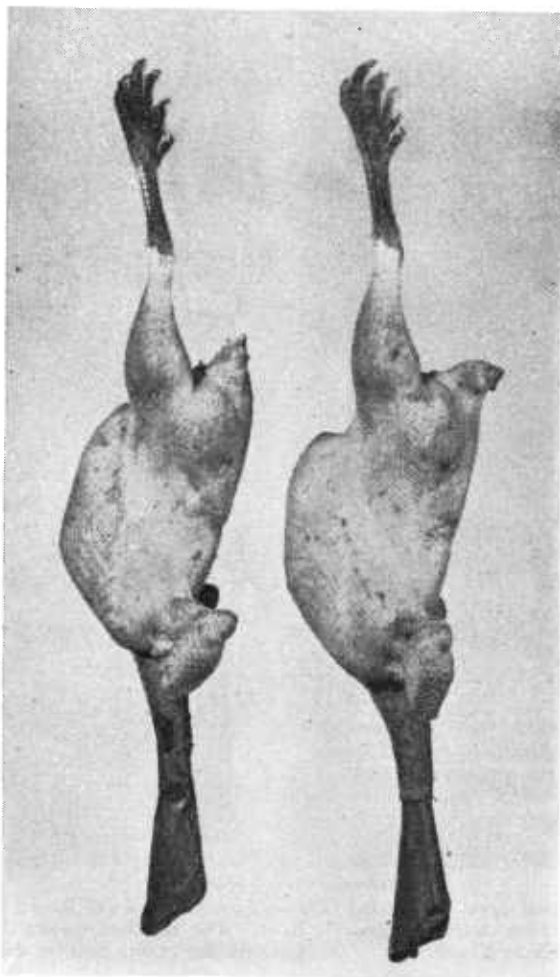
Figure 10.—Carcasses of Broad Breasted Bronze hens. The old hen on the left weighed 17 pounds, the young hen on the right 15½.

According to the National Turkey Improvement Plan, turkeys of any variety to qualify as broad-breasted, must measure $3\frac{1}{2}$ inches in breast width at a point $1\frac{3}{4}$ inches above the keel bone (toward the back) at the widest portion of the breast, at the time of selection which may vary from 22 to 30 weeks of age.

WEIGHTS OF TURKEYS

Turkeys that are well fed and managed, and free from disease and parasites, should make increases in weight comparable to those given in table 1, which gives the average weights at various ages of four varieties of turkeys raised under standard conditions of management with access to range. These birds were fed standard starting and growing mashes along with grain.

The weight of day-old poult depends upon size of egg and loss of weight during incubation. On the average, poult weight is approximately 66 percent of the weight of the fresh egg.



79773-B

Figure 11.—Good balance, left; poor balance, right, illustrated in carcasses of young Broad Breasted Bronze hens.

Young stock reach the so-called standard, mature, or midwinter weight at 34 to 36 weeks of age under favorable growing conditions. Under favorable conditions this also may be considered as age at first egg. Table 2 gives the weights for the standard varieties prescribed by the American Poultry Association in the Standard of Perfection. Weights for nonstandard varieties are those proposed by the originators of them, except in the case of the Broad Breasted Bronze, the weights for which are based on U. S. Department of Agriculture studies.

GETTING A START IN TURKEY RAISING

A beginning with turkeys may be made by obtaining hatching eggs, day-old poults, or breeding stock. The eggs and poults should be

from well-bred flocks free from pullorum and other diseases. When turkeys beyond the day-old stage are purchased, the disease history of the flock should be investigated and the stock should be examined for lice upon arrival. They should be quarantined for 2 or 3 weeks to detect any possible disease or internal parasites that may be carried.

TABLE 1.—Average weights of turkeys of 4 varieties at 2-week intervals during growth

Age (weeks)	Broad Breasted Bronze			Standardbred Bronze ¹		
	Males	Females	Both sexes ²	Males	Females	Both sexes ²
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
2.....	0.39	0.36	0.38	0.36	0.34	0.35
4.....	1.10	.97	1.04	.98	.84	.91
6.....	2.25	1.92	2.09	1.94	1.60	1.77
8.....	3.70	3.10	3.40	3.13	2.68	2.91
10.....	5.62	4.55	5.09	4.83	4.00	4.42
12.....	7.80	6.20	7.00	6.54	5.28	5.91
14.....	10.35	7.90	9.12	8.42	6.55	7.49
16.....	12.80	9.40	11.10	10.35	7.67	9.01
18.....	15.00	10.80	12.90	12.40	8.70	10.55
20.....	17.30	12.00	14.65	14.47	9.67	12.07
22.....	19.70	13.00	16.35	16.38	10.50	13.44
24.....	22.00	13.95	17.98	18.23	11.30	14.77
26.....	24.10	14.80	19.45	20.00	12.04	16.02
28.....	26.00	15.65	20.83	21.60	12.68	17.14
30.....	27.50	16.50	22.00	22.90	13.28	18.09
	Bourbon Red, Black, Narragansett, Slate, and White Holland			Beltsville Small White ³		
2.....	0.34	0.31	0.33	0.33	0.29	0.31
4.....	.88	.75	.82	.86	.72	.79
6.....	1.88	1.48	1.68	1.82	1.36	1.59
8.....	3.10	2.40	2.75	3.00	2.22	2.61
10.....	4.44	3.57	4.01	4.23	3.12	3.68
12.....	5.75	4.71	5.23	5.45	4.02	4.74
14.....	7.50	5.87	6.69	6.83	4.90	5.87
16.....	9.30	6.95	8.13	8.35	5.80	7.08
18.....	11.10	8.00	9.55	9.80	6.65	8.23
20.....	12.95	8.95	10.95	11.22	7.38	9.30
22.....	14.72	9.88	12.30	12.80	8.10	10.45
24.....	16.42	10.70	13.56	14.40	8.75	11.58
26.....	18.10	11.38	14.77	16.00	9.40	12.70
28.....	19.70	12.05	15.88	17.60	10.00	13.80
30.....	21.30	12.70	16.90	19.00	10.60	14.80

¹ The weights of larger strains of White Holland will equal or exceed those of standardbred Bronze.

² Unweighted averages, assuming that half are males and half are females.

³ Weights of Jersey Buffs are approximately 10 percent greater at all ages than those of the Beltsville Small White.

TABLE 2.—Standard or midwinter weights of turkeys

Variety	Young hen (less than 12 months old)	Yearling hen (12 months old and less than 24)	Adult hen (24 months and older)	Young tom (less than 12 months old)	Yearling tom (12 months old and under 24)	Adult tom (24 months and older)
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Standard Varieties:						
Bronze.....	16	18	20	25	33	36
White Holland.....	14	17	18	25	30	33
Bourbon Red, Narragansett, Black, and Slate.....	14	16	18	23	30	33
Nonstandard Varieties:						
Broad Breasted Bronze.....	18	20	22	32	38	41
Jersey Buff.....	12½	14	15	23	26	28
Royal Palm.....	11	13	15	22	26	30
Beltsville Small White.....	11½	12½	13	21	24	25

SELECTING A VARIETY

As long as prices received per pound are the same or nearly so for large and small turkeys, it usually is more profitable to raise one of the heavy varieties. This is especially true when the flock has access to range and the dressed birds are sold at wholesale. When a flock is to be raised in confinement on wire or slat floors, the small and medium-sized varieties find greater favor. In catering to the retail demand, the small- and medium-sized varieties are most adaptable. The live-turkey trade does not favor white or partly white turkeys; otherwise, plumage color is of little importance, except as it may affect personal preference of the grower. The selection of a well-bred strain within the variety is more important than that of the variety itself. A strain possessing good reproductive qualities, good livability, and good market quality, has numerous advantages. Some strains are inherently better than others in these respects. Pedigree breeding, combined with careful selection, is an effective means of improving the economic quality of turkeys and should be utilized more widely.

SELECTING BREEDING STOCK

The breeding stock is the foundation of a turkey enterprise and great care should be used in selecting both male and female breeders. The most satisfactory time of the year to select breeding stock is at a time when the birds are at or near market age, usually in October or November just before the surplus turkeys are marketed. Selecting breeding birds before marketing makes possible a choice from a larger number of the best-developed and most vigorous birds for breeding.

Turkeys are raised for meat rather than for egg production. The breeders, therefore, should have compact meaty bodies; the breastbone, or keel, should be straight; the back should be broad and parallel or nearly so to the breastbone; the body should be fairly deep with the breast smooth, broad, and full, its width carrying well back toward the rear; and the thighs and drumsticks plump and of good size. However, the breast should not be so broad and flat that the bird cannot walk in a normal manner and the legs should be placed well forward so that the carriage is upright with shoulders carried decidedly higher than the tail (fig. 2). A walking test should be given the breeders, especially the males, to be certain that they have an upright carriage and a free, easy, normal gait without waddling or limping. When a bird is suspended by the legs in a relaxed condition, the breastbone should extend well back between the legs so there is no noticeable gap between the front surface of the legs and the rear end of the breastbone (fig. 11). This characteristic, along with upright carriage and forward placement of the legs, constitutes the balance factor. Other important points are full bright eyes, a strong broad head without excessive coarseness, and stout legs set straight and rather short, but not so short as to interfere with walking or mating. The birds should be active, healthy, and vigorous. When pedigree and performance records of the birds' ancestors are available, selections should be based on high fertility, hatchability, and livability and also on early maturity with freedom from inherited weakness. It is advisable also to avoid inherited tendencies toward pendulous crop and deformed legs.

MANAGEMENT OF BREEDING STOCK

MANAGEMENT ON RANGE

Breeding flocks formerly were allowed free range and given little care throughout the breeding and laying season. This practice is not a profitable one, and modern methods demand that breeding flocks be kept under strict supervision and control and given good care and feeding. As a rule, moderate-sized pens or enclosures with nests conveniently located inside or outside the roosting area or shed should be provided. For a small farm breeding flock of 30 birds a cheap roosting shelter 12 by 16 feet and a yard containing about 6,000 to 9,000 square feet of range are needed. Frequently, an orchard is satisfactory. A poultry-wire fence about 6 feet high will confine the turkeys. Permanent fences should be stretched tightly and placed close to the ground to exclude dogs, coyotes, and foxes, which are destructive to turkey flocks. Fences, gates, and buildings 8 feet high or lower should be topped with antitflies—strips of lightweight poultry fencing—3 or 4 feet high to prevent turkeys from perching.

Sanitation in the breeding quarters must not be neglected. Either the fences and shelter should be made portable and moved each year to clean ground, or double yards should be constructed for use only in the breeding season, during which time one yard is occupied for a week, and then the other. During the unused part of the year these yards should be kept free from all poultry. Sloping ground having good, natural drainage is essential; no stagnant water should ever be permitted in a turkey yard.

When two or more breeding pens are maintained they should be separated from each other so that the toms will not distract one another and fight through the fence. The pens should be 10 feet or more apart, though sometimes it is feasible to use a single fence between them built solid for about $3\frac{1}{2}$ feet up from the ground so that the turkeys cannot see those in the other pen. Two yards for each pen so that the turkeys may be kept alternately in one and then the other is a practical and efficient arrangement. With a number of adjacent yards, a vacant yard is then always between the occupied ones. If trap-nesting is practiced, each yard should provide 100 square feet of average good range per bird; without trap-nesting, more range, up to 150 square feet per bird, may be provided.

Large breeding flocks of 100 to 1,000 or more breeding hens are now in common use, especially in the mild-winter sections of the country where the 500-hen unit is a popular size. Equipment such as portable nests or nesting houses, roosts, feeders, waterers, and sometimes fencing should be provided. The flocks should be protected at all times by an attendant, watchdogs, or by fences. At night, cannonball flares or electric lights provide protection against predatory animals. In cold climates, housing is a practical necessity if turkeys are to produce eggs in winter; cheap single-walled shelters are sufficient. Breeding flocks should be kept on clean, sloping, well-drained land on which green feed is growing. Usually the moving of these units is not necessary during the breeding season, but the occurrence of soil-borne diseases or parasites may necessitate weekly or biweekly moving.

A good method of management is to have 2 fenced yards, each providing 1 acre of good range per 300 birds, so that the birds may be

changed back and forth at weekly intervals. This method results in good use of green feed, improved sanitation, and discouragement of broodiness. Weekly moving of the complete flock to clean ground, as recommended for growing turkeys, is an excellent method of management and is good insurance against soil-borne diseases and parasites. Large flocks of Broad Breasted Bronze breeding birds sometimes are given shelter, but no roosts, the birds bedding down on litter or ground instead of roosting. However, low roosts usually are provided. Suitable equipment for all types of breeding turkeys is a low flat rack with roosts all on the same level 14 inches above the ground or floor and 19 to 24 inches apart from center to center.

BREEDING IN CONFINEMENT

Breeding in confinement (fig. 12) is practiced to a small extent and can be done successfully although access to clean range is preferable. Medium- and small-sized turkeys are much better suited to confinement operations than are the large varieties.

About 15 square feet of floor space is needed for each large-type bird or 12 feet for each small-type bird. About one-third to one-half of the total floor space should consist of a sunporch, floored, in order of desirability, with (1) 1- by 1-inch slats 1 inch apart, (2) inch-thick wooden strips $1\frac{1}{4}$ to 2 inches wide placed 1 inch apart, or (3) 1- by 4- or 1- by 2-inch mesh, 12-gage, welded, galvanized wire. Wire or slat floors must be placed far enough above the ground to allow for cleaning and proper air circulation. The minimum is 3 feet, the optimum $6\frac{1}{2}$. The inside quarters should have protection from the weather and possess, in order of desirability, a solid floor of concrete, boards,

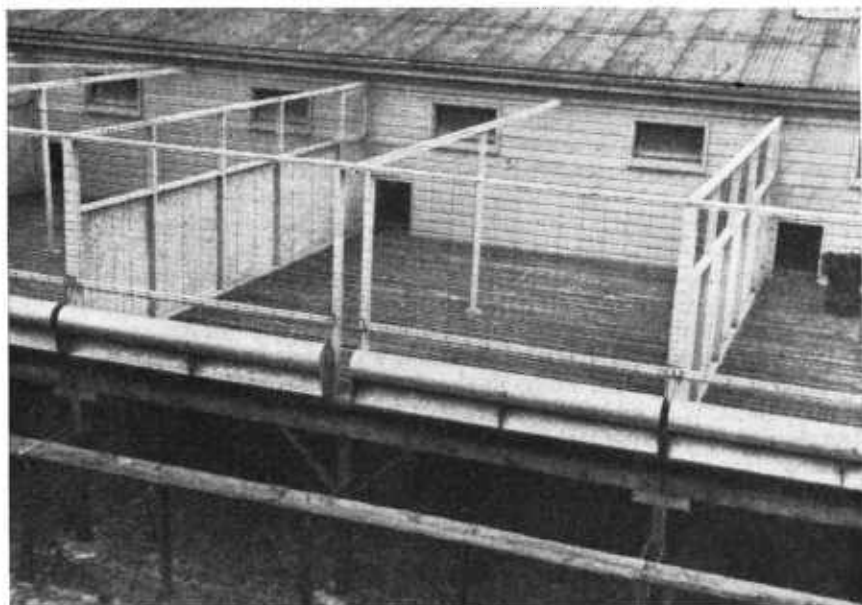


Figure 12.—Confinement breeding quarters in Delaware. Sunporch is slat-floored; inside pen is littered. Slats are 1- by 1-inch, and 1 inch apart.

or dirt, which should be covered with straw, peanut hulls, planer shavings without splinters, crushed corn cobs, shredded cane, peat moss, or other suitable litter. In general, it is satisfactory to build up the litter by putting clean litter on the soiled litter at intervals and then to clean it out only at the end of the breeding season. Excessive dampness near the water buckets may, however, render some cleaning necessary. It is, of course, entirely satisfactory to replace the litter at frequent intervals, but this requires much labor and gives no better results than built-up litter.

Slatted floors both inside and outside are suitable, but littered floors inside are more desirable, especially for heavy stock. It also is practicable to keep breeding stock indoors without a porch, provided 15 square feet of floor space is allowed per large-type bird, or 12 for small-type, and ventilation is ample. Breeding turkeys have been housed successfully in insulated, heated, and force-ventilated buildings with only about 10 square feet of floor space per bird.

Confined breeding turkeys are fed and, in general, managed in the same way as birds on the range. However, the diet must be adequate and well-balanced. Insoluble grit for grinding in the birds' gizzards should be provided along with oyster shell or granulated limestone unless these products are included in the mash in quantities sufficient for hens in heavy production, as in breeder diet No. 3. Baled legume hay helps to prevent feather picking and aids in nutrition. To lessen interference of males, baffle-boards may be set up at intervals throughout the house and porch. These are portable screens 8 to 12 feet long and about 30 inches high.

MATING

Turkeys older than a year seldom are used for breeding because, on the average, production, fertility, and hatchability are lowered considerably below first-year performance. However, where systematic breeding is practiced and records are available, proved birds of high breeding value should be retained. High-record hens in particular usually justify retention for a second or even third season. Males in high-producing matings likewise are valuable, but in all varieties there is a rather high percentage of sterility in males that have passed their first mating season. Single-male matings are desirable in pedigree breeding projects, but seldom are economical for the commercial production of hatching eggs and poults. With small-type turkeys in single-male matings, 20 hens to 1 young tom is a good proportion, with medium-sized turkeys 18 to 1, and with large-type 16 to 1. In flock matings where toms are not alternated, ratios of 17 to 1, 15 to 1, and 13 to 1, respectively, are practical. However, a few extra toms should be maintained as a safety precaution against losses. With the Broad Breasted Bronze, a common practice is to retain 1 tom for every 9 or 10 hens, divide the toms into 2 groups of equal size, and alternate the 2 groups weekly, penning the resting toms out of sight of the others. Some breeders maintain an extra set of late-hatched toms to replace the older toms about the middle of the breeding season.

Matings should be made up well in advance of the breeding season and sexually active males should be placed with the hens when lighting is begun. Early-season infertility may be caused by (1) failure to have the birds mated before breeding starts; (2) cold weather,

causing males to be sexually inactive; or (3) sexually immature males.

Saddles of canvas or other suitable material should be used on all large-type turkey hens if they are mated with correspondingly large toms. Small-type hens need not be saddled if mated to small-type toms, neither do standardbred turkeys other than the large types if they do not exceed standard weight. The saddle also may serve as a means of identification, the hen's number being marked on it in $\frac{5}{8}$ - to $\frac{3}{4}$ -inch figures with a rubber stamp or stencil pen and waterproof ink. The number should be placed on both lower rear edges and on the center and rear center. The numbers should be readable from the rear.

In all cases except where saddles are used, the toenails of breeding males should, at the start of the season, be clipped to, but not into, the core of the toenail and the stubs smoothed with a coarse file. Once during mid-season, the toms should be inspected and the toenails trimmed again if necessary. Spurs of older males, if sharp, should be clipped or filed to bluntness. An electric debeaker is useful for this work and with it the toenails may be cut off even with the flesh of the toe.

A PLAN OF BREEDING

A simple, effective plan for breeding turkeys called the systematic intercrossing system may be practiced with breeding flocks of any size from a single pair to several hundred, but is most useful in pedigree breeding using one-male matings. In pedigree breeding at least four, preferably seven or eight or more single-male breeding pens should be maintained and at the outset should be set up so as to provide as much divergence in blood lines as possible; that is, no two matings should be alike so far as relationship of the tom and the hens is concerned. In many cases relationships are not known and random selection is necessary. The hens in these pens should be trap-nested, the eggs marked and hatched separately, according to hen number, and the resulting poults individually banded to preserve their identity and make family selection possible. With larger breeding units containing two or more males, three pens should be sufficient and the need for making relatively unrelated matings at the start would be lessened. With this plan in any of its variations, introduction of new blood, other than at the start, is unnecessary and usually undesirable.

Where trap-nesting is not done pen pedigreeing is necessary so as to identify the offspring of each mating. When grown to market age, the best males and females from the best dams in each pen are selected and remain as the basic breeding unit. The females usually are returned to the pen from which they originated. The males, however, are moved over one pen each season. For example, females out of pen 1 remain in pen 1, but the males from pen 1 go into pen 2 for the next season's breeding. Likewise, pen 2 males go to pen 3 and so forth, completing the cycle until males from the last pen go back into pen 1. This procedure may be repeated indefinitely. Sometimes a whole pen may be discarded because of poor results, disease, accident, and other causes, in which case a new pen would be made up from the other pens or, if desired, from outside stock.

Selection should be based on individual physical characteristics and on performance of the mother hens as to egg production, egg-shell

quality, hatchability, fertility; and livability, rate of maturity, and market quality of their offspring. This plan avoids inbreeding, is simple, workable, and effective in maintaining and improving strains of turkeys. Reserve breeding males, two full or half brothers to the selected breeders for each pen, should be retained. These reserve males may be used profitably in extra matings for the commercial production of hatching eggs or poults.

Single-pen or flock breeding without trap-nesting, of 100 or more hens, may be carried on successfully over a period of many years by merely selecting the best females and mating them at random to the best males which would be their pen brothers. Selection would be based on physical characteristics in the absence of performance records.

SUMMER MANAGEMENT

All breeding hens and toms that are not to be used for another breeding season should be marketed about June 1 or as soon as there is no longer any demand for hatching eggs. This practice breaks the disease and parasite cycle and should be followed except in the case of high performing breeding stock. Birds kept until fall may be given access to good green range and fed a limited ration of grain. This may be any one grain except wheat, or any mixture including up to 50 percent wheat, at the rate of one-third pound per hen per day for large stock and one-fourth pound for medium and small stock. Toms that are being held over should be penned separately and given twice as much feed as the hens or have free access to it. If not given access to good range, holdover breeding stock should be fed free-choice a well-balanced growing mash and grain.

ARTIFICIAL LIGHTING

Artificial lighting may be used to induce turkeys to begin egg laying earlier than they would normally, when early eggs are in demand. Turkeys usually respond to artificial lighting with around 50-percent production within about 5 weeks after lighting is begun. Lamps may be turned on in December, January, or February, or even earlier. Special attention should be given to feeding and management in order to insure good fertility and hatchability of the eggs. The lamps should be turned on at the same time each morning; for example, at 4 a. m. The lamps should never be discontinued suddenly, but the time of lighting reduced gradually. The length of the lighted hours and daylight hours should be about 14 hours, but never over 15. Regularity in lighting is essential. A time clock or an ordinary alarm clock rigged with a simple switch may be used to turn on electric lamps. Gasoline and gas-mantle lanterns are also satisfactory, but should be handled with care to prevent fire.

Approximately 1 watt of incandescent light is required for each 3½ square feet of breeding-pen floor space or area to be lighted. Lamps should have standard reflectors or be placed under a board or roof to reflect the light downwards from 6 to 8 feet above the ground or floor in such a location that they shine on all the roosting space, feeders, and waterers. In mild climates, turkeys on outdoor roosts can be lighted successfully, but the wiring and lamps should be protected by an inverted trough or similar device which may be painted so as

to act as a reflector. Flood lamps encircling the area also are satisfactory. Heating breeding-stock quarters to 45° or 50° F. is considered profitable by some northern breeders.

Young hens should be about 7½ months old and young toms about 8 months old when first exposed to artificial light. About 4 weeks later egg production starts. Prelighting the males for 2 or 3 weeks is good practice in cold weather since they respond more slowly to artificial lighting than the hens. In warm climates prelighting usually is not necessary.

FEEDING BREEDING STOCK

Feeding young breeding turkeys consists in supplying a growing diet in the fall and winter prior to egg production, supplying a breeder diet during the laying season, and, if birds are kept over, supplying a maintenance ration during the summer months. Breeding stock carried through the summer on a maintenance diet responds economically to a fattening or weight regaining diet in the fall. When cool weather comes, usually early in October, the birds may be offered all they will eat of a grain or grain mixture, along with access to green feed. Within 4 weeks they will acquire a good market finish and make a gain in weight of 2½ pounds or more per hen and 4 pounds or more per tom. About 5¾ pounds of grain are required for each pound of gain during this 4-week fattening period. A little better finish is acquired in 6 weeks of feeding, but the grade is not improved and the gains are more expensive. Adult turkeys that are to be kept over for breeding should be held in the range lot as long as possible and also should be fed liberally in the fall on a standard growing diet in order to put them in good condition for breeding.

Later in the fall and through the winter prior to egg production, the feeds for breeders, especially young breeders, may be the same as those composing the growing diets normally fed to young stock. Grain and a simple mash, such as growing mash No. 1, make a good feed for carrying breeders through the winter if access to direct sunshine and succulent green feed is provided. For grain, a mixture of one-third corn or barley and two-thirds other grain is desirable. If the climate is such that green feed and sunshine are not available, as in the Central and Northern States, 10 to 20 percent of high quality alfalfa meal or alfalfa leaf meal and one-fourth of 1 percent of A-and-D feeding oil should be added to the growing mash. The birds should have all the mash and grain they will eat during the fall and winter. Breeding stock will not become too fat if fed as suggested. They will be fat, but this is desirable if heavy egg production is expected.

For the production of large numbers of hatchable eggs, turkeys require a diet containing adequate quantities of the various nutrients and vitamins. See table 3 for recommended nutrient allowances. Good results can be obtained with a simple breeder diet, such as No. 1, but only if the birds get an abundance of direct sunshine and fresh green feed hand-fed or from the range. Without these, a better-balanced diet such as the No. 2 or No. 3 breeder diet should be fed.

A breeder mash containing 21 to 24 percent protein should be kept before the birds at all times beginning about a month before eggs are expected or at the time lights are turned on. Grain should be fed in separate troughs or on top of the mash at the rate of 3 ounces per bird

Mash-Grain Breeder Diet No. 1

MASH :	Parts by weight	GRAIN :	Parts by weight
Ground yellow corn-----	26	Yellow corn (or grain sorghum or barley)-----	50
Pulverized oats-----	20	Heavy oats-----	50
Wheat middlings-----	20		
Wheat bran-----	10	Total-----	100
Meat scrap-----	12		
Fish meal-----	10	(Any mixture of common grains or any one or two grains fed separately also is satisfactory.)	
Ground oyster shell or lime- stone-----	1		
Salt, preferably manganized ¹ -----	1		
Total-----	100		

¹ A mixture of 100 pounds of fine salt and 1¾ pounds of anhydrous manganese sulphate or 2½ pounds of tetrahydrate.

per day in mated flocks of small-type turkey, 3½ ounces for medium-sized varieties, and 4 ounces for large-type turkeys, so that the total feed consumption will consist of approximately equal parts of mash and grain. It also is practicable to mix the mash and grain in equal proportion and keep the mixture before the birds at all times.

The mashes in breeder diets Nos. 1 and 2 contain approximately 21 to 23 percent protein. When fed with an equal amount of grain, the total protein consumption is 15 to 17 percent. The only supplements needed with these diets are clean water, insoluble grit such as gravel or granite, and granulated oyster shell or limestone fed free choice.

One of the new animal-protein factors, B₁₂ concentrate, may be added to any of the breeder diets in quantities recommended by the manufacturers to promote hatchability of eggs and livability of poults.

With breeder diet No. 1, turkeys should have access to sunshine and

Mash-Grain Breeder Diet No. 2

MASH :	Parts by weight	GRAIN :	Parts by weight
Ground yellow corn-----	26	Yellow corn (or grain sorghum or barley)-----	50
Wheat middlings-----	20	Heavy oats-----	50
Wheat bran-----	10		
Alfalfa leaf meal or alfalfa meal containing 17 percent protein, dehydrated preferred	15	Total-----	100
Meat scrap-----	5	(Any mixture of common grains or any one or two grains fed separately also is satisfactory.)	
Dried milk ¹ -----	10		
Fish meal-----	10		
Riboflavin supplement ² -----	1		
Ground oyster shell or lime- stone-----	1		
Salt, preferably manganized ³ -----	1		
Vitamin A and D feeding oil ⁴ -----	1		
Total-----	100		

¹ The dried milk, if unobtainable, may be replaced by (1) 4 percent dried whey and 6 percent more meat scrap or (2) 6 percent of soybean meal, 3 percent dried whey, and 1 percent steamed bonemeal.

² A fortified fermentation byproduct containing about 225,000 micrograms (225 milligrams) of riboflavin per pound.

³ See breeder diet No. 1, footnote 1.

⁴ Containing 400 A. O. A. C. units of vitamin D and 2,000 to 3,000 units of vitamin A per gram.

Breeder Diet No. 3 (All-mash)

	<i>Parts by weight</i>		<i>Parts by weight</i>
Yellow corn (medium grind)---	30	Meat scrap-----	3
Wheat middlings (standard or brown)-----	20	Fish meal-----	5
Pulverized or whole heavy oats---	20	Ground oyster shell (or lime- stone)-----	4
Alfalfa leaf meal or alfalfa meal containing 17 percent protein, dehydrated preferred-----	7	Riboflavin concentrate ² -----	1½
Wheat bran-----	4½	Salt, preferably manganized ³ ---	1½
Dried buttermilk or skim milk ¹ ---	5	Vitamin A-and-D feeding oil (fortified) ⁴ -----	1½
		Total-----	100

¹ The dried milk, if unobtainable, may be replaced (1) by 2 percent of dried whey and 3 percent more meat scrap or (2) by 2½ percent condensed fish solubles, 2 percent soybean meal, and ½ percent steamed bonemeal.

² A fortified fermentation byproduct containing about 225,000 micrograms (225 mgs.) of riboflavin per pound.

³ See footnote 1 for breeder diet No. 1.

⁴ See footnote 4 for breeder diet No. 2.

green feed on the range. If the turkeys cannot obtain succulent green feed and direct sunshine in abundance, as in case of those kept in confinement or those fed for hatching-egg production in unfavorable weather, the diet must be more nearly complete, as is diet No. 2, fed as suggested above.

Essentially the same ingredients as in diet No. 2 can be mixed and fed as an all-mash diet as in breeder diet No. 3 with excellent results. The all-mash diet is recommended except in situations where it is important to utilize home-grown, unground grain. It contains about 16 percent protein.

This all-mash mixture is kept before the mated breeders at all times. Where extra toms are maintained separately, grain may be fed free choice along with the all-mash diet. Give only enough mash to carry the birds through each day, and provide a fresh supply each morning, as freshness is important. If daily feeding is impracticable, feed once or twice a week and let the birds empty the feeders before new feed is added, to prevent any accumulation of stale mash. The A-and-D feeding oil should be mixed fresh in the mash every 2 weeks for best results in preserving its vitamin-A content. If pulverized oats are difficult to obtain, whole oats may be substituted.

If desired, the oystershell or limestone may be left out of the all-mash diet (replacing it with whole or pulverized oats) and fed in granulated form separately in hoppers. However, mixing it in the mash saves labor and prevents excessive consumption. Gravel, granite, or other insoluble grit should be provided to furnish grinding material for the gizzard. Clean water, placed in contamination-proof vessels should be provided at all times. Water dishes should be washed every day with cloth or brush and rinsed, before refilling. Alfalfa or other legume hay fed separately cannot be depended upon to supply adequate quantities of green feed for hatching-egg production but is a good supplement especially for breeders kept in confinement. Only by fresh green feed obtained from range or hand fed, or by green-feed substitutes and vitamin-bearing oils mixed in the feed can these requirements be met.

All feeds should be fed in feeders, never on the ground or in the

litter. Feeders should be constructed so as to prevent waste and contamination with droppings. The mashers may be fed in pellet form, if desired, to prevent wastage by wind. When oats or barley in ground form is included in a mixture, it should be finely ground or pulverized to prevent possible injury to the respiratory system from the sharp particles of hulls which are the result of coarse grinding. Alfalfa meals and leaf meals should be bright green in color and of medium grind. Vitamin A and D feeding oils should be standard, good-quality products containing 400 units of vitamin D and 2,000 or preferably 3,000 units of vitamin A per gram.

Broad Breasted Bronze breeding birds consume about 0.55 pound of feed each daily during the laying season, when given access to range and all the feed they will eat. Turkeys of the standard varieties consume about 0.45 pound, and small-type turkeys about 0.37 pound. Without access to range, these figures should be increased by 10 percent.

EQUIPMENT FOR BREEDING STOCK

Roosts

The best roosts for all types of turkeys older than 8 weeks are poles preferably 2½ inches in diameter, placed 19 to 24 inches apart. Either 2-by-3's or 2-by-4's, wide side up, also are satisfactory. A practical arrangement for all types of turkeys is to build roosts in sections on skids with all roosts 6 to 12 inches above the ground. About 12 linear inches of roost space per bird for breeding stock is needed for small-type turkeys, about 13½ inches for those of medium size, and about 15 inches for the large types. For turkeys other than the large broad-breasted types, roosts may be tilted to a 15° or 20° angle, with 1 foot rise in every 4 feet and built in the shape of a low, gable roof. In permanent quarters, 2- by 4-inch mesh 12½- to 14-gage welded wire may be nailed to the undersides of the roosts. The wire may be placed loosely on top of the roosts but in such case it should be of lighter gage wire. Ordinary poultry fencing may be nailed around the sides, thus forming a completely enclosed droppings pit. The wire under or over the roosts prevents injury to the birds, gives a better walking surface, and keeps the birds out of the droppings.

Nests

A good size for individual nests is about 16 by 20 inches and 20 inches high with the front opening 8 inches wide and 9 inches high for large birds. For smaller birds these dimensions may be an inch less each way. Such nests will accommodate one or not more than two hens at a time and hens cannot pile up as they do in larger nests. Partitions between nests should have 3-inch openings near the middle to provide ventilation.

Some breeders use a self-closing gate at the front to allow only one hen to use the nest at a time. Such a gate may be built with four slats nailed at right angles to a cross-piece pivoted at the top but set tight enough so that it will not swing freely. When open the gate stands with one set of slats projecting outward and the other downward. When the bird enters it pushes one set upwards and the set behind comes down and closes the gate to other birds. On leaving the

nest the bird opens the gate which then stands ready for the next. Such an arrangement prevents piling of the hens and reduces soiling and breakage. One of these self-closing nests should be provided for each four hens.

Another type, known as group nests, are cheaper to build and easier to move but do not eliminate breakage and soiling. Such nests may be made 2 feet wide, 6 to 8 feet long, and 20 inches high with a shed-type roof, solid back and ends but open front except for an 8-inch baseboard. Such nests may be built without a floor and if placed on well-drained ground the nesting material may be omitted.

Nesting materials include rice hulls, straw, shavings, and sawdust. About 50 hens may be accommodated in one section 2 feet wide and 8 feet long.

In hot weather, nests of any type should be well ventilated in order to avoid overheating and the birds should be prevented from piling.

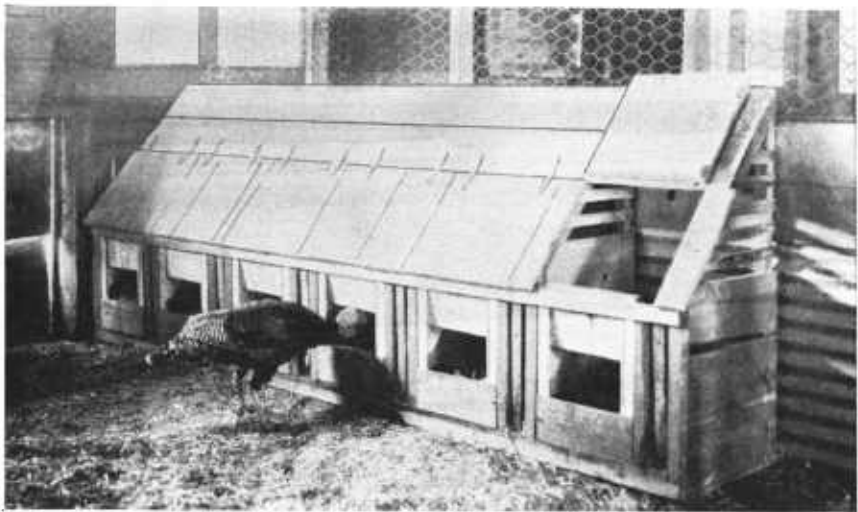
Small litter-floored nesting houses are the most satisfactory. A good size is 6 by 8 feet and high enough for the attendant to enter.

Turkeys are not extensively trap-nested, but some breeders who wish to do selective pedigree breeding are now carrying on this practice. One trap-nest should be provided for each two hens. With this many nests, three visits a day by the attendant are sufficient. During the period prior to the beginning of egg production, the hens should have access to the trap-nests. They must be watched carefully to see that they do not lay their eggs elsewhere than in the trap-nest. Secluded places in the house or yard should be eliminated. A satisfactory type of trap-nest is illustrated in figure 13. The turkey enters at the front through the trap door which closes automatically when the bird is inside. The door at the top of the coop is opened to release the bird from the nest. Plans for these nests may be obtained by writing to the U. S. Department of Agriculture requesting A. H. D. No. 21. The use of numbered saddles facilitates trap-nesting considerably as the birds do not then have to be handled so much as is necessary when the legband numbers have to be read.

Broody Coops, Feeders, and Waterers

Broody coops should be well lighted, have slat or wire floors and roosts, or else should consist of a yard or building containing extra toms. Usually four coops are provided, since 4 days in the broody quarters are required. The broody hens are moved from one broody pen to the next, being turned loose in the flock on the fifth day. The usual feed and water should be provided. For outside feeding, a large magazine-type feeder (fig. 14) is very practical, although the trough type (figs. 15 and 16) is widely used inside and out. In confinement quarters, feeders and waterers may be hung on the walls of the sun porch or the inside quarters. Waterers may be of any convenient type and should provide a minimum of one-fourth linear inch of watering space per bird.

Cleanliness of the water and the watering device is most important. An automatic float valve or valve depending upon weight of water to regulate the flow is very useful where running water or water-storage barrels or tanks are used. Continuously flowing fountains or bubblers, with drain attached, also are desirable as they are sanitary, frostproof, labor saving, and easy to keep clean. In



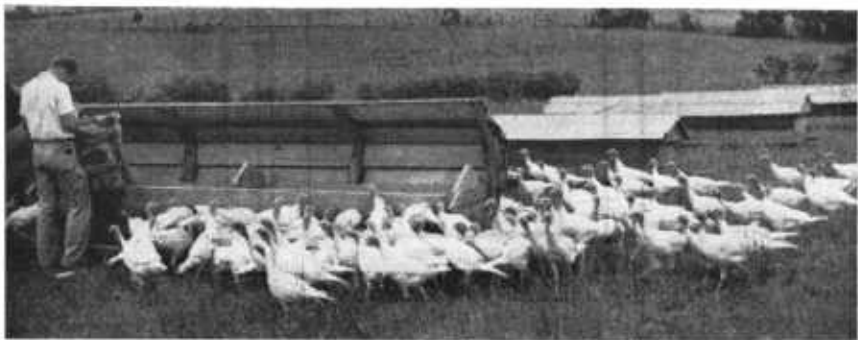
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Figure 13.—Turkey trap-nests. The dimensions of this nest are as follows: Width, 14 inches; depth, 24 inches; height in front, 19 inches; and height in back, 45 inches. The trap-nest fronts may be home-made, or bought.

subfreezing weather the water, unless it is running, should be warmed. Electric and oil-burning water heaters may be used. Use of water direct from a natural source should be avoided as a general rule, as such water may carry disease germs or parasites.

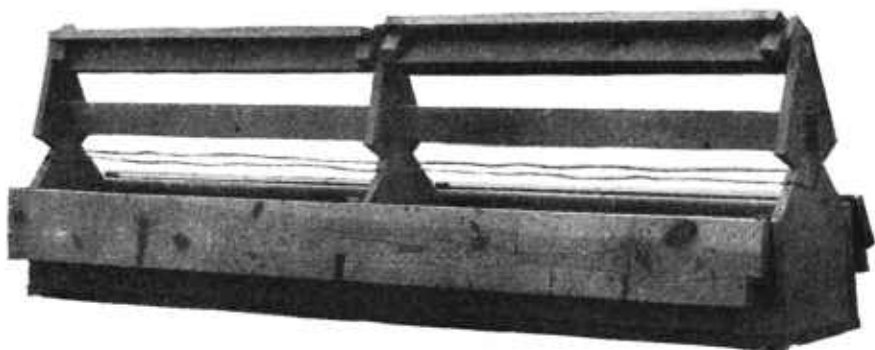
PRODUCTION AND CARE OF EGGS

Soon after mating begins, the female looks for a nesting place and 2 to 3 weeks after first mating she begins to lay. The number of eggs per hen produced in a season depends on the breeding of the stock as well as on climate and management. Average date of first egg of the young hens in a flock is 30 to 35 days from the time lights are first turned on. In the northern States, without artificial lighting, young turkey hens should average about 40 eggs a year, and hens in their second laying season about 30 eggs, during the normal breeding season,



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Figure 14.—Range feeders of fairly large capacity.



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Figure 15.—Trough feeder for turkeys 12 weeks and older. The end plan of this feeder is shown in figure 16.

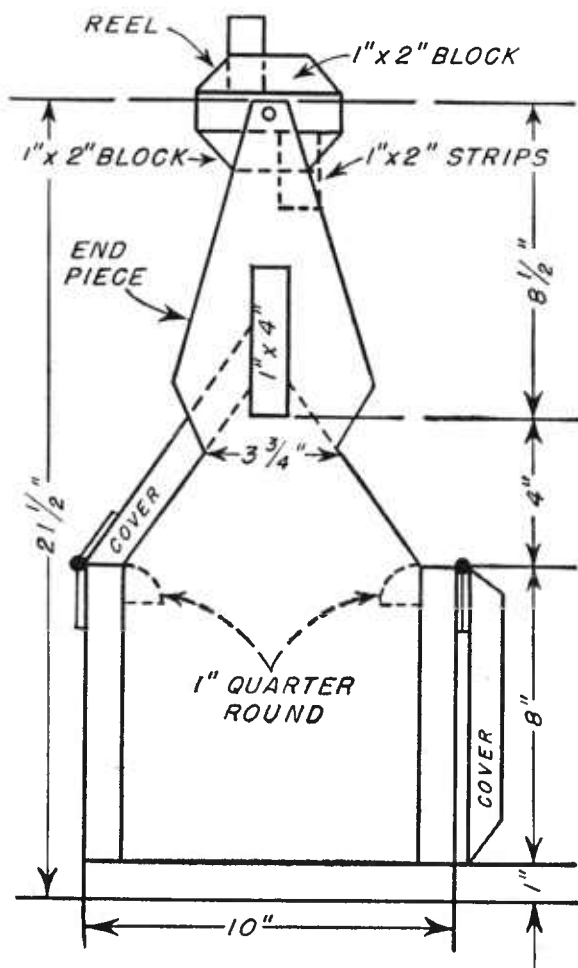


Figure 16.—Diagram of end of mash hopper for turkeys. The side view is shown in figure 15.

if they are broken up when broodiness occurs. By normal breeding season is meant the time between the date when the first egg is laid in late winter or early spring and June 1. In the South, or in the North if artificial lamps are turned on about February 5, young breeding hens should average about 50 eggs each per season, or an average of about 17 eggs per month up to June 1.

Turkey eggs are spotted, have a strong shell, a very strong shell membrane, and a firm yolk enclosed by a weak vitelline membrane. They are as palatable as chicken eggs, and are excellent for cooking, two being used in place of three chicken eggs. They are noticeably pointed at one end and vary in general over-all color from dark brown to cream color, the average being a light brown. Occasionally, turkey hens lay white, unspotted eggs. The first-year eggs of the large Broad Breasted Bronze turkeys average about 38 ounces per dozen, or 90 grams each; those of the medium-sized standard varieties, 36 ounces per dozen, or 85 grams each; and those of the Beltsville Small White, 34 ounces per dozen, or 80 grams each. However, strain differences sometimes are greater than variety differences. Lumpy shells are not uncommon and if not thin-shelled, the lumps do not affect hatchability. Yearling hens lay eggs averaging around 7 percent heavier than those of hens in their first laying season. If turkey hens are well matured their first eggs are practically as large as they will be at any time during their first season, but if brought into production while immature the eggs are smaller at first.

Unless the broody turkey hens are to be used for incubating eggs, they should be broken of broodiness promptly so that good egg production may be obtained. About 4 days in the broody coop with access to regular feed and water usually suffices.

Freshly dressed turkeys are in demand at all times of the year and this demand is growing. To meet it, turkeys may be hatched throughout the year, especially December through July. It is difficult, though not impossible, to obtain fair quantities of hatching eggs from August through November. It can be done by proper management as with chicken hens. Poults hatched in December or January should be ready to market in July and August. Through the use of artificial light and proper feed, hatchable fall and winter eggs may be obtained. Hatching poults in August and September also is practicable, especially in the South, to supply the winter and Easter demand for fresh-killed roasting turkeys. It requires 22 to 26 weeks to produce well-fattened roasting birds with small-type turkeys and 26 to 30 weeks with medium- and large-type varieties. Cool weather in the fall aids in maturing the birds, hence late-hatched turkeys are well adapted to southern climatic conditions, whereas early-hatched turkeys are best raised in the Northern States.

It is natural for turkey hens to seek secluded places to lay their eggs. Yards that have comparatively short vegetation and are free from bushes or other places of concealment are best. Hidden nests should be located and the eggs collected regularly, to prevent losses. In commercial egg production, it is essential that all possible precautions be taken to insure the complete and regular gathering of all the eggs laid. A minimum of four times daily is necessary and in many cases hourly gathering is essential to avoid breakage and soilage.

Eggs held for hatching should be stored on their sides or small ends,

never on their large ends, at temperatures between 45° and 65° F. Hatchability can be damaged seriously by holding eggs for hatching at temperatures above 65° or below 45°. It is most important to hold eggs in a room that can be kept between these temperature limits, preferably between 50° and 60°. The ideal appears to be about 55° with a relative humidity of about 80 percent. Temperatures of 29° to 44° and 66° to 85° are not harmful if not maintained for more than about 12 hours. At 28° eggs begin to freeze. Some ventilation should be provided in the egg holding quarters to prevent mold growth.

For best results under average practical conditions eggs should not be stored longer than a week but if they are held at a suitable temperature and turned once a day, hatchability will be retained very well for 14 days and fairly well for as long as 3 weeks. Eggs held not longer than a week need not be turned prior to setting.

INCUBATING TURKEY EGGS

The inherent quality of the breeding stock, the manner in which it has been fed and managed prior to incubation, the care given the eggs, and the incubation itself all may influence the hatchability of the eggs. Well-managed turkey hens should produce, during the normal breeding season, an average of 25 mature offspring.

The period of incubation of turkey eggs is 28 days and the method used is essentially the same as that used with chicken eggs. Turkey eggs can be hatched successfully by turkey hens, chicken hens, or in an incubator. Hatching in incubators has largely replaced natural incubation. Turkeys hatched and reared by hens, especially chicken hens, are likely to contract disease and become infested with parasites at an early age. Turkey hens can cover from 15 to 18 turkey eggs; chicken hens, from 7 to 10 turkey eggs.

NATURAL INCUBATION

Hatching turkey eggs under turkey hens, although not recommended, sometimes is the most practical method. When the turkey hen becomes broody and has remained consistently on the nest for 4 or 5 days, she should be given the eggs. If several turkey hens are sitting at the same time, care should be taken that each gets back into her own nest. Nests may consist of boxes about 2 feet square or barrels laid on their sides. Nests should be protected against rain, and also against rats, crows, and other animals.

Nests should be flat and shallow, as deep nests may result in crushed eggs or poults. Nests with damp sod bottoms and a little straw to keep the eggs from rolling into the corners, or batteries of nests, each nest provided with a small individual run, are usually satisfactory, as the hen can get off and on the nest at will. With the latter method, the only care necessary is to see that feed and water are always before the hens and that each one remains broody. If individual runs are not provided, hens should be taken off daily, allowed to exercise and eat, and then returned to their own nests. Plenty of water to drink and grain of some kind should be provided along with fresh green feed or green hay. Chicken hens used for incubation are handled in this same manner, and either type of hen should be freed from any lice prior to setting.

ARTIFICIAL INCUBATION

Correct incubator temperatures are the same for turkey eggs as for chicken eggs, but with some kinds of natural-draft (flat-type) incubators, an adjustment of the thermometer or thermostat must be made because of the greater size of the turkey egg. This is true in natural-draft incubators in which the thermometer is suspended from the top of the machine or sits on a stand. Where the thermometer lies on top of the eggs, no adjustment is necessary and the incubators can be operated according to temperature directions for hatching chicken eggs. The proper position of the thermometer for hatching turkey eggs usually is indicated in the directions furnished by the manufacturer. As a general rule, with the bottom of the bulb $1\frac{7}{8}$ inches above the floor of the egg tray or just a little below the top surface of the eggs, the thermometer should read 100.5° F. for the first week, 101.5° the second, 102.5° the third, and 103° the last week. Another alternative is to maintain a temperature of 102° F. throughout the hatch. At no time should the temperature be allowed to exceed 103° . Forced-draft incubators usually are run at about 99.5° but may vary a little in different types. Temperature can be regulated best by following the manufacturer's instructions. Make sure the egg trays in natural-draft machines do not sag as sagging trays cause harmful variations in temperature.

Excellent hatches have been obtained when the loss of moisture, based on the weight of the eggs just before they were set, ranged within the following limits: After 6 days of incubation, 2 to 3 percent; after 12 days of incubation, 4.1 to 6 percent; after 18 days of incubation, 6.2 to 9 percent; and after 24 days of incubation, 9 to 12 percent. The ideal is $2\frac{1}{2}$, 5, $7\frac{1}{2}$, and 10 percent, respectively. On this basis, a dozen turkey eggs of normal size (3 ounces each) should lose about 1 ounce during each 6 days of incubation. The air cells of turkey eggs

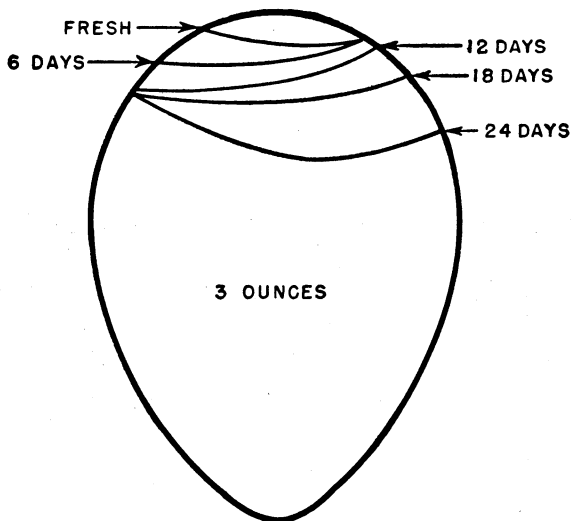


Figure 17.—Diagram showing proper size of air cell after 6, 12, 18, and 24 days of incubation at 60 percent relative humidity.

are smaller in proportion to the size of the egg than are those of chicken eggs because normal evaporation in turkey eggs during incubation is somewhat less than in chicken eggs. Proper size of air cells is indicated in figure 17.

When more moisture is needed in the incubator, it can be provided by wetting the floor, by putting pans of water in the incubator, or by placing burlap wicks in the pans already there. When less moisture is needed, water pans may be removed or the ventilation increased. The incubators should be kept in a ventilated basement or an insulated, ventilated room above ground whenever possible. Uniform room temperature of about 70° F. and a fairly high relative humidity ranging between 40 and 60 percent are important features in a good incubator room.

In modern force-draft incubators, the humidity usually is indicated by a wet-bulb thermometer and is controllable easily by a humidity-regulating device. Turkey eggs should be incubated for 23 to 24 days in a relative humidity of 55 to 60 percent and finished off at about 70 percent. Relative humidity is determined by the use of dry- and wet-bulb thermometers. A difference in the reading of the thermometers of about 12½ degrees represents a relative humidity of about 60 percent and a difference of 9 degrees about 70 percent. In machines maintained at a dry-bulb temperature of about 99½° F. during the 28-day period, wet-bulb readings of 85° to 87° for the first 23 to 25 days and 90½° for the last 4 to 5 days are desirable. If the dry-bulb temperature of the hatcher is 97°, the wet-bulb should be about 88°. Probably the twenty-fourth day of incubation, counting as the first day the day following that on which the eggs were set, is the best time to candle and transfer eggs to the hatching trays or separate hatching machines.

As a rule, the eggs should be turned at least three and preferably five to eight times daily up to the twenty-third or twenty-fourth day. Three times daily every 8 hours, day and night, is a good plan to follow where eggs must be turned by hand; where turned automatically or semiautomatically, once every 3 hours, day and night, is advisable. Turning after the twenty-fourth day is not desirable.

Candling the eggs to remove those that are infertile or have dead germs gives valuable information and eliminates waste of space occasioned by incubating unhatchable eggs. Under commercial conditions, testing usually is done only at the time the eggs are transferred to the hatching trays on the twenty-third or twenty-fourth days. However, they may be tested on the seventh to ninth day and/or on the twenty-third or twenty-fourth day. Infertile eggs appear clear, free of spots, and have a free-floating yolk fairly regular in outline. Eggs containing dead germs will show development less than that expected. The yolks may appear irregular in outline, may have a blood ring, or a stuck embryo or yolk, and usually do not have the reddish appearance observed in normal growing embryos. Eggs containing strong germs will have a reddish appearance, development will be advanced according to that which is normal at the time the eggs are candled, the embryo will be free floating and the spider-webbed condition caused by the blood vessels will be observed.

Cooling the eggs between the fourth and twenty-fourth days of incubation may be of value in some poorly ventilated natural-draft incubators, but is never done in well-ventilated machines or those of

the forced-draft type. Cooling until the eggs feel lukewarm to the touch once a day is sometimes practiced, but its value is doubtful except where it provides needed fresh air.

After the twenty-third or twenty-fourth day the incubator door, if it has glass in it, should be darkened and kept closed until hatching is completed. If incubation has been normal, hatching will be finished by the morning of the twenty-eighth day of incubation and the poults should then be removed immediately, placed in the brooding quarters, and given feed and water. If they are to be shipped, they should be put in poult boxes and shipped as soon as possible. If held in the incubator, the temperature should be kept at about 97° F. and the poults should have a rough surface, such as quarter-inch mesh hardware cloth, to stand on. A smooth surface, such as that provided by newspapers, is likely to cause leg injury to the poults. Keeping the incubator dark tends to keep the poults quiet.

Shipping day-old poults in standard poult or chick boxes is satisfactory, but poults are injured by being kept from feed and water for much more than about 24 hours after hatching. Poult shipping boxes are larger and higher than those ordinarily used for baby chicks and are made to accommodate 100 poults, 25 per section. If chick boxes are used, only 60 poults, 15 to a section, should be placed in each, and fewer in warm weather.

BROODING POULTS

Poults may be brooded naturally by turkey or chicken hens or artificially by brooders. Brooding by hens provides a never-failing source of heat, allows the poults to be raised in small flocks, and permits taking advantage of free-range conditions. Its disadvantages are that young turkeys may contract disease or become infested with parasites from the hens and they may wander too far and be killed by storms or predatory animals. Furthermore, natural brooding is not adaptable to commercial enterprises and is not recommended, except where artificial methods are impracticable. Artificial brooding simplifies disease and parasite control, keeps down costs, puts the poults more directly under the control of the operator, and is adaptable to large-scale production.

NATURAL BROODING

As soon as the hatch is completed and the poults become active, transfer the hen and her brood to a coop. The coop should be large enough to accommodate the hen and her brood comfortably and give protection from rain and natural enemies. It should be about 5 feet long, 3 feet wide, and 3 feet high, with a raised ratproof floor. Provide good-sized screened openings for ventilation and light. These openings should be so fixed that rain will not beat into the coop. Have a separate coop for each hen, and if there are several broods, place the coops some distance apart on well-drained soil where the grass is fairly short; or better, provide a wire-floored, wire-enclosed porch for the hen and poults, keeping both off the ground.

For the first day or so confine the poults in the coop with the mother hen, providing plenty of light so the poults may learn to eat and drink. Then make a wire-floored porch or a small yard using boards or wire

on the front of the coop, and allow the poults to run in and out at will. However, they should not be allowed to run in long wet grass, or to be out during heavy rains. At night they should be confined to the coop. Unless a wire or slat-floored porch is provided (which is safer in keeping poults free from diseases and parasites), move the coop and yard to fresh ground every few days, and clean it once a week or more frequently. For litter in the coop, clean sand free from silt is best, especially at first. After the poults are 2 or 3 weeks old, sand, wheat straw, shredded corn stover, processed cane litter, crushed corn cobs, peat moss, or mineral litter may be used.

When the poults are about a week old, the mother hen may be allowed on the porch with her brood or given the freedom of a yard, but care should be taken to see that the birds return in the evening and are protected at night. Good results may be obtained by keeping the mother hen confined and allowing poults to range, but the poults must be watched during storms to prevent losses. Hen-brooded poults may be fed in the same manner as those artificially brooded, keeping starting mash and clean water before the poults at all times.

Where the hen is confined, the mash may be placed out of her reach after the first 2 or 3 days while the poults are learning to eat. Keeping feed before the poults at all times promotes faster growth and cuts down excessive ranging which usually results in losses. Where the mother hen is not allowed to eat the starting mash, she should be provided with whole grain and green feed.

The poults may be kept with the mother hen 3 months, but better results usually are obtained by moving the poults to a separate rearing field on clean ground and with a shelter when they are 8 weeks old. Turkey hens of average size will brood up to 20 poults successfully, but up to 25 can be brooded in warm weather.

ARTIFICIAL BROODING

Young turkeys are susceptible to cold and dampness, but after the age of about 12 weeks they become resistant and can be raised with very little protection, even in cold climates. During the brooding stage, plenty of heat and dry, well-ventilated quarters are essential. With good equipment, turkeys are easy to raise, but with poor equipment, they are difficult to raise. Standard brooder houses and brooders that supply an abundance of heat are required for the first 8 weeks in all sections of the United States.

Brooder houses for turkeys need be but little different from chicken brooder houses and there are many kinds to choose from. Colony brooder houses are described in Farmers' Bulletin 1538, Incubation and Brooding of Chickens. Some State agricultural colleges publish plans for suitable brooder houses of the colony-house, and large, multiple-unit types. The multiple-unit brooder house may be long, facing south, usually with a 4-foot service alleyway along the rear side. A newer type has its long axis running north and south, with a service alleyway in the middle and row of brooding rooms on either side, one facing east the other west. A small, lamp-heated brooder house utilizing the heated-floor principle has proved successful in the Southern States for small-scale operations.

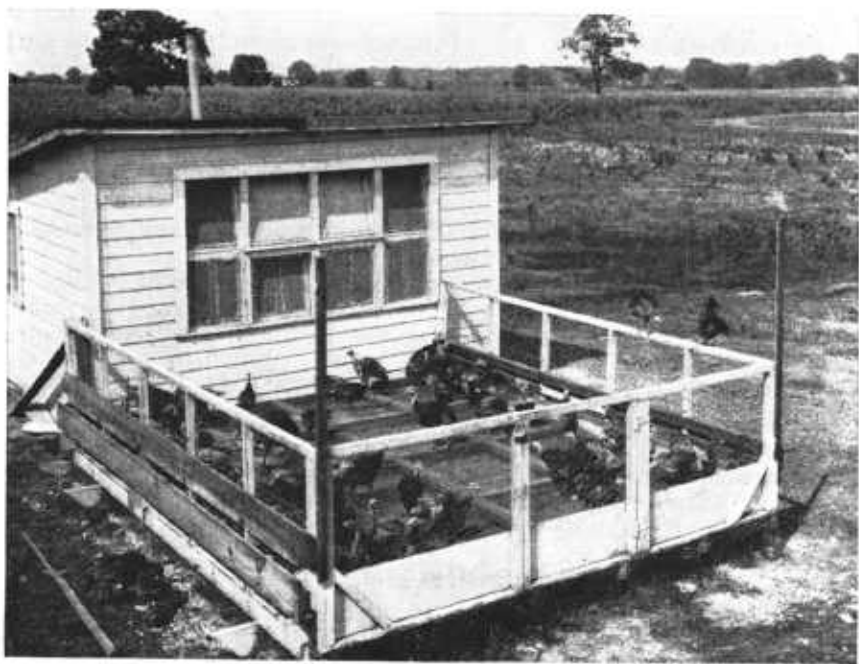
For a colony brooder house or a unit in a long house, good sizes are 9 by 14 feet, 12 by 14, or 14 by 16 feet, on up to units as large as

30 feet square. A unit 15 by 30 feet, to handle 250 to 300 poults, is practical in commercial operations. In the 9 by 14 unit, with an outside run or a sunporch half its size, about 180 poults may be accommodated to 8 weeks of age or 125 poults to 12 weeks. Poults to 8 weeks each require three-fourths square foot of floor space in the brooder house if an outside yard is provided. If a sunporch is used, 1 square foot of combined building and porch floor space is needed. If no porch or yard is available, the building should provide 1 square foot per bird. If brooding is carried to 12 weeks instead of 8, about 50 percent more floor space is required.

Sunporches are used widely, but brooding without porches or yards is becoming more common, as it is often as cheap and more convenient from a construction and management standpoint to provide the required 1 to 1½ square feet of floor space per bird in the house itself, rather than dividing it between house and porch. Some brooder houses are built as a combination house and porch as shown in figure 18.

Large brooding units, each about 20 by 30 feet, sometimes several in one long building without yard or porch, equipped with 3 large brooder stoves placed 10 feet apart, each one housing 200 poults, are used successfully. The poults in each brood are separated from those in other broods by a brooder fence about 1½ feet high for the first week or so, then all 600 poults are allowed the freedom of the large room. Oil, coal, or wood-burning brooder stoves may be used.

Brooder-house floors may be wire- or litter-covered, clean sand free from silt or clay generally being the most satisfactory type of litter, as neither will harm the poults and they lower the fire risk. If the



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Figure 18.—Young turkeys in the wire-floored sunporch of a colony house.

sand contains much silt it will cake and form hard balls on the poult's toes. Sand should be dry and put in about 4 inches thick at first. It should be raked daily to remove accumulated droppings. Another method, known as the built-up litter plan, calls for a thin layer at first and more added at weekly or more frequent intervals. Other suitable types of litter for starting poult's include nonstringy peat moss, crushed corncobs with particles under $\frac{1}{4}$ inch in diameter removed, shredded corn stover, and the new types of mineral litter. After the poult's are 2 or 3 weeks old such litters as crushed cobs or peanut hulls, corn stover, shredded cane, peat moss, wheat straw, clean planer shavings free from splinters, and sand may be used, but not such litters as splinty shavings, hay, oat or bearded barley straw, oat or cottonseed hulls, dried beet pulp, or sawdust which are likely to cause damage to the digestive tract. In any case, cleanliness is essential.

Wire floors or underfloor heat make the use of litter unnecessary. They save labor and as a general rule prevent serious damage from filth-borne diseases, such as coccidiosis, blackhead, and hexamitiasis. Wire floors should be well ventilated underneath to prevent odors and fly breeding, but long stretches of unobstructed open space underneath should be broken up by solid wood or metal partitions about every 20 feet. For converting a brooder house designed for use with litter, welded-wire floor sections 4 or preferably 6 inches high with 1-inch mesh top surfaces make good floors and can be removed easily for cleaning. The wires of the mesh should be of 10-gage galvanized metal and carefully welded.

At the start of brooding, strips of $\frac{1}{2}$ - by 2-inch mesh, 12-gage or 0.4-inch mesh lighter gage hardware cloth should be laid over the larger mesh to cover about two-thirds of the brooder room including the part under the hover. These strips, except for the portion under the hover, should be removed at about 3 weeks, the poult's then using the 1-inch mesh for the remainder of the brooding period. The fine mesh under the hover should remain until the poult's are about 5 weeks old when most of them will be roosting. Wire with larger openings than those indicated will cause damage to the poult's legs and, where poult's are banded, tend to catch and tear out the band. Meshes smaller than 0.4 inch quickly become clogged with droppings.

Removable wooden floor sections of convenient size to fit the brooding quarters and covered with $\frac{3}{4}$ - or 1-inch mesh, 14-gage hardware cloth, made of 1- by 6-inch boards or similar material placed about 1 foot apart and raised about 6 inches off the solid floor to allow for under-floor ventilation may be used instead of welded-wire sections. Small-mesh wire may then be used on top as suggested for the welded-wire sections. Wire floors also may be built in solidly, but in this case, room underneath for cleaning, preferably 3 feet or so, must be allowed. Ample heat must be provided where wire floors are used and it is important that sufficient ventilation without strong floor-drafts be provided.

RADIANT HEAT

Underfloor heat, popularly called radiant heat, is new and is meeting with considerable favor in cold-weather areas. Wrought-iron water pipes with inside diameter of 1 to $1\frac{1}{4}$ inches or $\frac{3}{4}$ -inch copper tubing are laid on crushed stone or gravel (but not cinders) and covered with

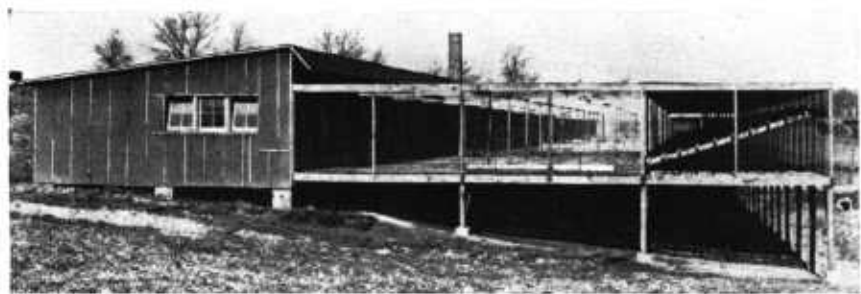
about 1½ inches of concrete, or preferably, laid with 1¼ inches of concrete under them, 1½ inches over them, and 9 to 15 inches, usually 12, apart on centers, in the floor of the room. Usually the pipe network is built in sections each with separate control of water flow. Litter and roosts sometimes are eliminated, feeders and waterers being the only interior furnishings needed. However some operators use one-fourth to one-half inch of silt-free sand for litter and install roosts near the windows, and on the sunporch which should have an area one to two times that of the radiant-heated floor. Wire partitions about 2 feet high with an 8-inch baseboard, placed 20 to 30 feet apart to divide the house into sections, are desirable.

Circulation pumps for the return pipes, complete drainage of the pipes, and correct engineering principles are necessary if this system is to be used successfully. Water temperatures sufficient to maintain a temperature at the floor of about 90° F. are desirable at the start. About 1 square foot of combined porch and house floor space per poult is needed until poults are 8 weeks old; and up to 1½ square feet by the time the poults are 12 weeks old. Sunporches should be utilized to obtain maximum poult capacity for the radiant equipment. Ventilation, preferably without strong drafts, and sufficient to keep the air sweet, is essential. A large brooder house with porch is shown in figure 19.

BROODING REQUIREMENTS

Ample heat is a prime necessity in turkey brooding. Where brooders are used, the temperature just above the floor away from the hover should be 70° to 75° F.; under the hover, 95° to 105°. To obtain these temperatures, a brooder providing plenty of heat is essential, except in warm-weather brooding when electric brooders or other types that do not provide an excess of heat may be used successfully.

With most brooding systems, perches of the stepladder type, allowing 3 to 4 lineal inches per bird, should be provided for the poults almost from the start. They may be made of 1½- to 2-inch poles, 2 by 2's, or similar material placed 8 to 10 inches apart on centers, the lowest one about 6 inches from the floor, each succeeding one 2 to 4 inches higher. The roosts may be placed in the rear of the house if rear lighting is provided or they may be placed in front near the windows.



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Figure 19.—A brooder house in Virginia having a 10,000-poult capacity. The house, equipped with radiant heat, is 18 feet wide; the large porch 36 feet wide. A 20-foot boiler and feed room is in the center, with a 150-foot wing on either side.

Poults will not take to the roosts readily if the roosts are placed in a dark portion of the house. Figure 20 shows some essential equipment in a brooder house.

Poults should have $1\frac{1}{2}$ to 2 linear inches each of feeding space at the feeder to 8 weeks and 2 to $2\frac{1}{2}$ inches thereafter. Home-made feeders such as those shown in figure 21 are satisfactory. Where litter is used in a brooder house, feeders may be placed on platforms made of 1- or 3- or 1- by 4-inch material and $\frac{3}{4}$ - to 1-inch, 16-gage, hexagonal mesh or hardware-cloth wire; or if left on the litter, the feeders should be moved and the manure removed daily by raking or stirring.

It is important to provide one-half linear inch of watering space per poult for the first few days and one-fourth linear inch after that. At the start screw-top quart fruit jars inverted in glass bases distributed around the room near the hover and feeders are excellent, but ordinary tip-up waterers are satisfactory. It is essential that all watering devices be washed every day with a clean cloth or suitable brush, then rinsed, and refilled with clean water. This is a most important procedure, particularly in hot weather, and applies to all types of waterers. As with feeders, waterers should be placed on wire-covered platforms or if on the litter, the droppings and damp litter should be removed daily, and the waterers moved. Where liquid milk is fed, waterers made of glass, wood, or tin should be used excluding all galvanized waterers.

The inside corners of the brooder house should be rounded with woven wire, hardware cloth, or boards to prevent crowding. Windows should be adjustable for ventilation. An automatic ventilation system with intakes and cupolas is satisfactory and convenient, but not

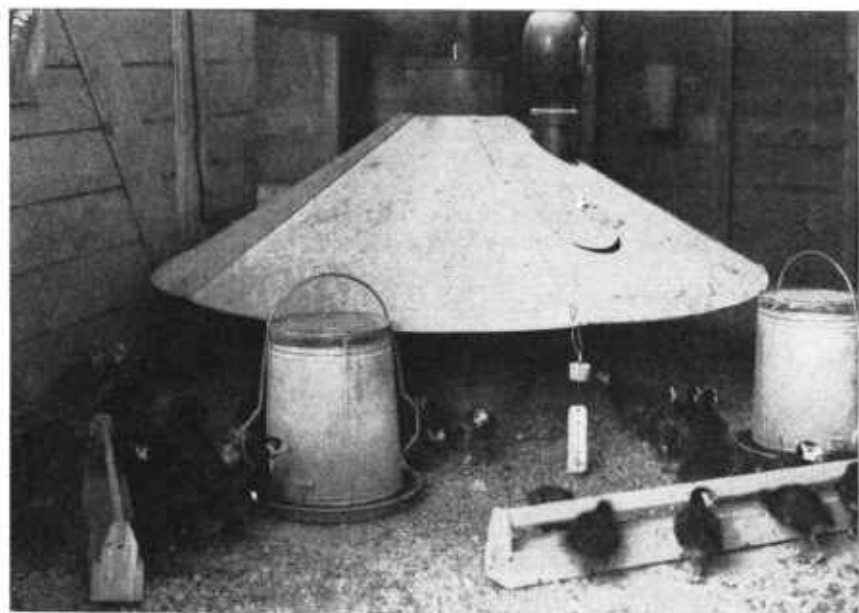


Figure 20.—A coal-burning brooder stove and Black poults only a few days old. The feeders and waterers are conveniently located.

necessary. For brooding in cold weather, floors should be tight and warm. Where floors are raised off the ground, double boarding with building or roofing paper between is necessary. Concrete floors should be dry and water-proofed, otherwise they will be too cold. Where electric brooders are used, a board or wire mesh platform of No. 21 $\frac{1}{2}$, or 0.4-inch, mesh is necessary under the hover to keep the poult off the damp, cold floor in cold weather. Walls usually are made of matched siding, flooring, composition board, or of rough boards in double thickness with paper between in cold climates. Roofs also may be made of galvanized metal, aluminum, composition roofing over boards, or of treated plywood or insulation board.

Colony brooder stoves of good design heated by gas, oil, wood, or coal are in wide use, although continuous, hot-water piping systems also are popular, and are safest from fire and provide the most reliable source of heat. The pipes are 1 $\frac{1}{2}$ inches in diameter, and are placed 2 to 3 inches apart, 14 inches above the floor, and 3 to 4 feet from the back wall of the house. One to four pipes carry hot water from, and four to six pipes return it to, the boiler. The group of pipes is covered with tar paper or roofing to form a warm hovering space. It is best to use circulating pumps for the water and place the pipes all on the

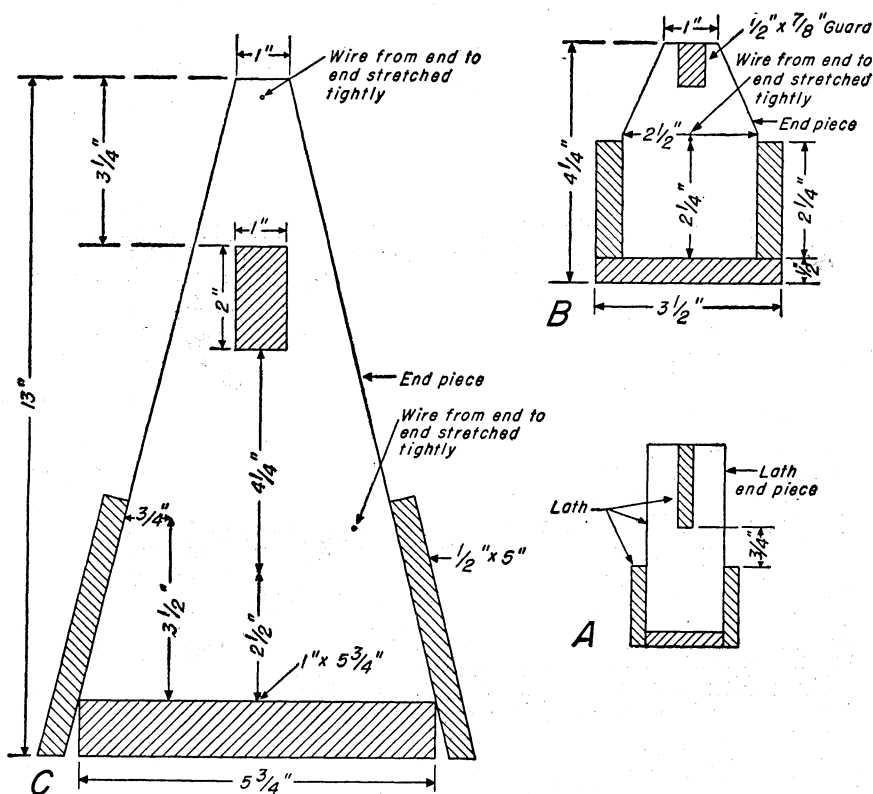


Figure 21.—Cross section of trough feeders for turkey poults of various ages; A, lath feeder for first week; B, feeder for second to fourth weeks; C, feeder for fifth to twelfth weeks. Feeder C will give better results if equipped with a reel, at the top, similar to that shown in figure 15.

same level from end to end of the building or at a very slight incline to facilitate draining. Water temperature may be carried at about 160° F. under average conditions.

Electric brooders are relatively safe from fire, but are subject to power interruptions and, except in warm, dry weather, must be supplemented by heat from some other source because as a rule they do not provide sufficient heat to keep the litter dry and the house itself sufficiently warm for turkey poults. High-wattage types that are lightly insulated tend to heat up the room better hence are better suited to cool-weather brooding. However, with supplementary heat from stoves, or a hot-water system to keep the room temperature near the floor at 70° to 75° F. electric brooders are satisfactory unless located where power interruptions are frequent. In this case, an auxiliary power plant should be provided or some other source of heat used.

Lamp brooders and other oil- or gas-burning brooders that do not have a stovepipe to carry off the fumes do not give best results. However, the gas-burning type, where gas is readily available, is superior to the kerosene burners and is satisfactory in mild weather if house ventilation is good and the birds are not overcrowded.

In the selection of any brooder, a reliable make suited to local conditions and of demonstrated efficiency should be obtained.

BATTERY BROODERS AND BROODING

Starting turkeys for the first 1½ to 2 weeks in batteries and then transferring them to floor-brooding units is a practice gaining in popularity. One disadvantage is that battery-brooded poults do not hover well when placed in floor-brooding units. Special care must be taken to teach them to hover; piling and smothering must be guarded against. However, if placed in units of not over 200 in a well-heated brooding house, little difficulty is encountered.

For battery brooding, regular chick batteries (fig. 22) may be used, but those designed for turkeys are more satisfactory and when sufficient inside height or head room, and floor space are provided, poults may be brooded in them up to 4 or 5 weeks of age. It is even possible by the use of plenty of floor space and about 2 feet of head room to battery-brood poults up to 7 or 8 weeks of age and then transfer them to range shelters or confinement rearing equipment. By using porches in connection with the batteries, less space in the battery is needed per poult.

Batteries usually are constructed of steel and wire and contain a hovering compartment heated by electricity or provided with a feather board. A minimum of 12 inches of head room and one-eighth square foot of floor space per poult are desirable for brooding to 1½ or 2 weeks.

The battery sides in front of the feeding and watering troughs should be made of vertical wire sections adjustable sideways so that poults of different ages may be able to eat and drink through the grill without escaping or becoming caught. The same result is accomplished by an adjustable hinged grill over feed and water troughs. Feeders and water troughs are hung on the outside of the front and sides of the battery. However, at the start, for the first day or two, it often is desirable to place small fruit-jar waterers and some mash on cup flats or pie plates inside feeding compartments.

Batteries can be operated successfully only in rooms uniformly



10892-A

Figure 22.—Poults in battery brooder with electrically heated hover sections in rear.

heated to 70° or 75° F. and sufficiently ventilated to keep the air fresh. Relative humidity should be maintained at 40 to 60 percent. Lighting should be bright and uniform so as to encourage the activity of the poults in all the battery sections. Electric lamps are left on day and night to supplement the natural daylight. Droppings should be removed from the batteries daily or as often as necessary to avoid odors. The water troughs must be washed and rinsed daily and refilled when necessary.

FEEDING YOUNG TURKEYS

For the first 24 to 72 hours after hatching, poults can live without feed or water, the yolk of the eggs which they have absorbed before hatching being sufficient to maintain them for that length of time. However, the sooner they are fed, the better, and in any event they should be fed as soon as they are put into the brooder house, in order to prevent excessive eating of the litter. Poults kept from feed and water for much more than 24 hours after hatching learn to eat and drink with difficulty. It is common practice to see that the poults are fed and watered within 24 hours after hatching. Long shipping distances that involve more than a 24-hour delay are undesirable.

The first feed may be starting mash or crushed pellets (granules) upon which is scattered a little oatmeal or tender, finely chopped green feed which also should be placed in the water fountains. As in battery feeding, these materials should be placed in small heaps on clean boards, pie plates, or cup flats underneath the hover for the first

day or two. An abundance of small feeders is essential at the start and these feeders should at first be heaped with mash or granules to attract the poults' attention. The feed should be kept continuously before them. Pelleted mash may be fed after the first 3 or 4 weeks, but poults do not take well to it at the start—they seem to prefer dry mash or granules. The feeding of liquid milk is not recommended for poults, but when its protein and vitamins are needed it may be fed as suggested on page 43.

Although finely chopped tender green feed is good for poults in guarding against nutritional deficiencies and encouraging them to learn to eat, feeding it is usually impractical due to labor costs and difficulty in obtaining suitable types. Most turkey growers prefer to feed a complete starting mash so as to eliminate the necessity of feeding green feed. Where green feed is fed, use alfalfa, clover, or onion tops, Dutch clover, young tender grass, or green grain sprouts chopped fine into $\frac{1}{4}$ -inch lengths. Feed once or twice daily. Wilted green feeds never should be allowed to remain before the poults.

FORCE FEEDING

Poults that will not or do not learn to eat and drink quickly may be saved by force feeding. Make a soupy mixture of regular starting mash with water or milk. Take the small end of a 25-cubic centimeter glass laboratory pipette in the mouth and by suction fill the pipette with the mixture. Open the poult's mouth, insert the large end of the pipette down the poult's gullet beyond the entrance to the lungs, then force out enough of the food to fill the crop comfortably. One such feeding usually is enough but two or more may be needed in stubborn cases. A skilled operator can force-feed poults in this manner at the rate of about 150 per hour.

STARTING FEEDS

Commercial starting mashes or starters in loose or granulated form are generally available and in many localities these are the only types of feeds obtainable. Ingredients necessary to make up good mashes may not be available on the local market. In any case, the selection of a good commercial mash or a good formula properly mixed, containing high-quality ingredients is necessary. Protein, mineral, and vitamin content are the main points to be considered. A standard starting mash or "starter" containing from 24 to 26 percent protein or a high-energy feed with 27 to 30 percent protein is desirable.

Recommendations for meeting the nutritional requirements of poultry, prepared by the National Research Council, Washington, D. C., are presented in table 3. These amounts are sufficient to allow a good margin of safety in compounding diets.

The following starting mash is recommended for feeding turkey poults during the first 8 weeks. This mash is a complete feed, needing no supplements except water and insoluble grit, such as granite, mica, coarse sand, or gravel, which may be hand-fed lightly on top of the mash, added to the mash at a 1-percent level, or offered in separate feeders or hoppers. However, if sand is used for litter, additional grit need not be fed. The crude protein of mash No. 1 is estimated at 23 to 25 percent.

TABLE 3.—Recommended nutrient allowances for turkeys

Nutrient	Amount per pound of feed for—		
	Starting poults, 0-8 weeks old	Growing turkeys, 8-16 weeks old	Breeding turkeys
Total protein.....percent.....	24	20	15
Vitamins:			
Vitamin A activity.....I. U. ¹	4,000	4,000	4,000
Vitamin D.....A. O. A. C. units ²	800	800	800
Riboflavin.....milligrams.....	2		1.8
Choline.....milligrams.....	900		
Minerals:			
Calcium.....percent.....	2	2	2.25
Phosphorus ³percent.....	1	1	0.75
Manganese.....milligrams.....	25		15
Salt ⁴percent.....	0.5	0.5	0.5

¹ The protein content of rations for growing turkeys from 16 weeks to market weight may be reduced to 16 percent.

² May be either fish oil vitamin A or provitamin A from vegetable sources. I. U., International Units.

³ This is the official unit of the Association of Official Agricultural Chemists.

⁴ This amount of calcium need not be incorporated in the mixed feed inasmuch as calcium supplements fed free choice are considered as part of the ration.

⁵ At least 0.4 percent of the total feed should be inorganic phosphorus such as that found in the animal protein supplements, bonemeal, and dicalcium phosphate.

⁶ Represents added salt.

This starting mash should be fed along with clean water. Grain of the size fed to hens may be given free choice with the mash, starting at 6 to 8 weeks. Soluble grits, such as limestone, should not be fed. The mash in dry form should be kept before the poults at all times but stale mash should not be allowed to accumulate in the feeders. Pelleted mashes may be fed but it is desirable to start the poults on the loose mash or granules (crushed pellets) and change over to pellets after 3 or 4 weeks. Pelleted or granulated mash is not so likely to be billed out of the feeders nor blown away by the wind and, therefore, is preferred to the loose mash by many growers. Pellet feeding tends to discourage feather picking.

To adapt this formula to liquid-milk feeding, replace all the dried milk or distillery or fermentation byproducts and half the fishmeal, meat scrap, and soybean meal with ground corn. Feed the liquid skim

Starting Mash No. 1

	Parts by weight		Parts by weight
Soybean meal.....	24	Pulverized limestone or oyster shell.....	2
Ground yellow corn.....	22½	Granite grit of size fed to chicks ¹	1
Oats, finely ground or pulverized.....	15	Salt, preferably manganized ²	1
Wheat middlings or ground wheat.....	10	Fermentation byproduct riboflavin supplement, 225 milligrams of riboflavin per pound ³	1
Alfalfa leaf meal or alfalfa meal containing 17 percent or more protein, dehydrated preferred.....	8	Vitamin A-and-D feeding oil.....	½
Wheat bran.....	5		
Meat scrap.....	5		
Fish meal.....	5	Total.....	100

¹ If poults have access to sand or gravel, the grit may be omitted.

² A mixture of 100 pounds of fine salt and 1¾ pounds of anhydrous manganese sulphate or 2½ pounds of tetrahydrate.

³ In lieu of 1 part of this high-potency product, 5 parts of dried milk, or 2½ parts distillers' solubles and 2½ parts dried whey may be used, reducing the corn accordingly.

milk or buttermilk in a sweet or slightly sour condition avoiding the use of galvanized receptacles, keep it before the poults at all times, and furnish some water, allowing one receptacle of water to three or four of milk. Clean the milk receptacles carefully every day and be sure the poults cannot get into them.

GROWING FEEDS

Diets for growing poults after 8 weeks of age generally include both mash and grain. Keeping mash and grain before the turkeys at all times is the recommended method of feeding to promote normal growth and quick maturity. Usually special methods of fattening are not necessary, the birds being fed the regular growing feeds up to the time of marketing. Oats are a good fattening feed and usually are palatable to turkeys. Turkeys intended for fryers should be fed the mash and whole heavy oats free choice starting at from 6 to 8 weeks.

Mashes suitable to different conditions and fed to turkeys from 8 weeks of age to marketing, may be made up as shown in tables on page 45.

Growing mashes Nos. 1 and 2 are for flocks having continual access to good green range. In mash No. 2, soybean meal which has proved to be a good source of protein and also good for fattening, is substituted for meat scrap. Mash No. 3 is a more nearly complete high-protein concentrate and is suitable for all conditions where the turkeys have access to range, but do not necessarily have a continual abundance of growing green feed such as turkeys grown on poor or dried-up range. Concentrate feeds such as this allow maximum use of grains. When fed a concentrate free-choice with grains, turkeys grow and finish well, eating relatively more grain, but in spite of this, tend to use more protein than necessary.

Concentrates are an advantage only when grain is relatively easy to obtain and is cheap compared with the mash. Mash No. 4, if fed with insoluble grit and a grain mixture containing at least one-third yellow corn and one-third oats, is a complete diet suited to turkeys reared in confinement without green feed if they have access to direct sunshine. It is, however, unnecessarily expensive and high in vitamins for turkeys grown with access to good green range.

Growing mashes are fed along with one or more of the grains, such as corn, wheat, barley, oats, spelt, emmer, hog millet (proso), or sorghum grains. Any of these may be used as the only grain, except that with No. 3, two or more grains should be used, and with No. 4, a mixture containing 33 percent or more of cracked yellow corn and 33 percent or more of oats should be provided. A combination of grains for general use may be made of one-third corn; one-third wheat, sorghum grain, or barley; and one-third oats, or these grains may be offered free choice. Whole corn is not eaten liberally by turkeys under about 18 weeks of age, hence should be cracked and cleaned (freed of meal) when fed prior to that age. Rye, buckwheat, and rough rice are satisfactory feeds for use after turkeys are 8 weeks old but should be fed in limited quantities and in combination with one or more of the common grains, such as corn, wheat, oats, or barley.

Free-choice feeding of two or more grains is good practice and does away with mixing, an advantage especially where home-produced grains are fed. Free-choice feeding consists of placing the different

grains in separate feeders or feeder compartments. Oats usually are very palatable to turkeys hence are best fed mixed or free-choice with one or two other grains to prevent excess consumption of oats. Cost and availability of the grains largely should determine the kind of grain fed as the grains all have about the same value in turkey growing and fattening diets. Oats, common barley, emmer, spelt, rough or paddy rice, buckwheat, and proso, due to their higher fiber content, are worth 80 to 85 percent as much per hundred pounds as corn, wheat, rye, hullless barley, brown rice, and the sorghum grains, but when this difference in digestible nutrients is allowed for, they are just as good for growing and fattening purposes. The grains contained in the mash should be balanced with other grains in the whole-grain portion

Growing Mash No. 1

	<i>Parts by weight</i>
Ground yellow corn or barley ¹ -----	25
Ground oats ¹ or grain sorghum-----	25
Wheat middlings or shorts ² -----	20
Meat scrap, 50 or 55 percent protein-----	19
Wheat bran ² -----	10
Salt, fine sifted-----	1

Total ----- 100

(Estimated crude protein, 19 to 21 percent)

Growing Mash No. 2

Ground yellow corn or grain sorghum-----	30
Ground oats ¹ or ground wheat-----	30
Soybean meal-----	30
Steamed bonemeal-----	6
Ground oystershell or limestone--	3
Salt, fine sifted-----	1

Total ----- 100

(Estimated crude protein, 20 to 21 percent)

Growing Mash No. 3

Meat scrap (50 or 55 percent protein)-----	20
Soybean meal ³ -----	20
Alfalfa meal, 17 percent or more protein or leaf meal, dehydrated preferred-----	15
Wheat middlings or shorts ² -----	10

Growing Mash No. 3—Continued

	<i>Parts by weight</i>
Sardine or tuna fish meal ⁴ -----	10
Wheat bran ² -----	7½
Ground yellow corn-----	7½
Steamed bonemeal-----	6
Ground oystershell or limestone--	1½
Salt, fine sifted-----	1½
Riboflavin concentrate ⁵ -----	1

Total ----- 100

(Estimated crude protein 32 percent, calcium 4.9 percent, and phosphorus 2.3 percent)

Growing Mash No. 4

Ground yellow corn-----	28
Wheat middlings or shorts ² -----	15
Alfalfa leaf meal or alfalfa meal containing 17 percent or more protein, dehydrated preferred--	15
Soybean meal ³ -----	15
Sardine fish meal ⁴ -----	6
Wheat bran ² -----	6
Steamed bonemeal-----	6
Meat scrap (50 or 55 percent protein)-----	5
Ground oystershell or limestone--	2
Riboflavin concentrate ⁵ -----	1
Salt, fine sifted, preferably manufactured ⁶ -----	1

Total ----- 100

(Estimated crude protein about 22 percent, calcium 3.2 percent, and phosphorus 1.4 percent)

¹ Barley and oats in turkey mashes should be pulverized or finely ground.

² The bran and shorts may be replaced by an equal quantity of ground wheat or wheat mixed feed (shipstuff, mill feed, or mill run).

³ Corn gluten meal, cottonseed meal, or peanut meal may be substituted for the soybean meal except in mash No. 2. Soybean meal or soybean oil meal is the processed meal minus the oil, not ground soybeans.

⁴ If sardine or tuna fish meal is unobtainable or impractical to use, additional meat scrap may be substituted.

⁵ A distillery or fermentation byproduct containing not less than 225,000 micrograms of riboflavin per pound (500 per gram).

⁶ See footnote 2, starting mash No. 1.

of the diet so as to obtain a variety of grains in the total diet. For example, if in growing mash No. 2, 30 percent of corn and 30 percent of oats are used, a good grain to feed with it would be barley, or wheat, or grain sorghum alone, or almost any combination of the grains other than corn or oats alone.

The mash formulas suggested are only a few of many possible combinations of ingredients. Growing mashes may be made up of other combinations of grains, grain byproducts, protein feeds, and vitamin supplements, the exact composition depending largely on availability and cost of ingredients. It is best to use two grains, and preferably three or four, in the total diet.

Yellow corn tends to produce yellow skin color, while most of the other grains, including white corn, oats, sorghum grains, and barley produce turkeys with white-colored skin. Wheat of certain types, if fed in moderation, produces a white skin, but if fed in very large quantities along with abundant green feeds may produce yellow skin in birds carried to a high degree of finish.

After 8 weeks of age, if turkeys are given all the liquid buttermilk or skim milk they will drink along with whole grains and access to range, they will consume enough milk to make good growth without water. A mixture of 35 percent corn, 30 percent oats, 20 percent wheat, and 15 percent barley is satisfactory; so is a free choice of several grains. However, this method of feeding works well only when the turkeys are on a good green range and is practical to use only when liquid milk is very cheap. Some loss from pendulous crops is to be expected when liquid milk is consumed liberally and this is one of the chief objections to its use. The milk receptacles should be set on a wire or slat screen, kept clean, and protected from contamination with droppings.

GENERAL SUGGESTIONS FOR FEEDING

Feed should be kept before turkeys constantly from hatching to market age and, if kept for breeding, during the period prior to egg-laying and during the breeding season itself. Put feed in hoppers or troughs; not on the ground. From 9 weeks to marketing, supply a growing mash and grain. No grain need be fed during the first 8 weeks, but some growers prefer to feed it from hatching to 6 weeks, using grain of the size fed to chicks at first, changing to whole or cracked grains at about 6 weeks. If a change is made from mash-feeding to the feeding of whole grain and liquid milk described above, cut down the mash gradually until the poults learn to drink the milk and eat the whole grain freely. The change from starting to growing mashes may be made quickly without special methods. During the last 6 weeks before marketing, turkeys should not be moved long distances or subjected to radical changes in management or feeding, as this might slow down the finishing process.

Vitamin D, the sunshine vitamin, is necessary in starting diets, but as a rule it is not necessary in growing diets, unless the birds are confined without access to direct sunshine. In that case, irradiated animal sterol (dry vitamin D) is the preferred source, adding it in quantity sufficient to provide about 720 A. O. A. C. units of vitamin D per pound of 18- to 24-percent protein growing mash.

Fish meal, though an excellent feed, may impart an undesirable fishy flavor to turkey meat, therefore, as a general rule fish meal and

fish oil should be omitted from the growing diet at least during the last 10 weeks or so before the birds are marketed. However, small amounts of undiluted fish oil, one-eighth of 1 percent or less of total diet, and of tuna or sardine (pilchard) fish meal, 5 percent or less of total diet, may be used safely. Other types of fish meal should in general be avoided in growing diets. These figures mean that in 18- to 24-percent protein standard growing mash, pure fish oils should be limited to 0.2 percent and sardine or tuna fish meal to about 8 percent. A-and-D oils, being only part fish oil, may be used safely in these mash in amounts up to about 0.4 percent. In mash containing more than 24 percent protein, the allowance of the fish products may be increased by one-fourth.

Feeding the growing mash wet has been a common practice in some localities, but now is little used. It produces fine-quality turkeys, but the labor in feeding is greater without compensating advantages. With this method, turkeys are fed all they will eat of a moist crumbly mash placed in troughs, sufficient trough space being provided to accommodate all of the flock at one time. Only as much mash as the birds will clean up in 30 to 60 minutes is fed once or twice daily, along with all the grain they will eat with free access to range. This method tends to reduce feather picking.

Grit in the form of coarse sand, commercial quartz prepared for small chickens, or other insoluble grit should be furnished to small turkeys, and gravel or insoluble commercial grit to larger birds. The grit should be nonshatterable. Sand or gravel is as effective as manufactured grit. The limestone grits in general do not serve well as grinding material and are unnecessary with the starting and growing diets listed and with most commercial mash. Limestone products and oystershell should be fed only to supply calcium and are incorporated easily in the mash. If there is any doubt as to the calcium content of the growing or finishing mash, either limestone or oystershell may be fed sparingly in hoppers or on top of the mash late in the growing season to guard against possible calcium deficiency. Excessive consumption should be avoided however.

The free-choice method of feeding mash and grain is recommended in preference to limited feeding with free range. However, conditions sometimes demand that free range be permitted, and limited feeding practiced. In such cases, when natural feed is abundant, reasonably good results can be obtained by feeding the poults, after they are 8 to 10 weeks old, only once daily, all the mash and grain they will eat. However, if they are ranging on grain stubble or are harvesting edible seeds or grain in the fields, the grain may be omitted. Any of the growing mash listed should make a good supplement to range feeds. Plenty of clean water in convenient locations is fully as essential as feed and always should be provided.

Harvesting of grains in the field by turkeys may be done successfully, proso (or hog millet) and the grain sorghums being most frequently harvested in this manner.

FEED CONSUMPTION

Table 4 shows the feed consumed by three types of turkeys reared to different ages under both confinement and range conditions. The flocks contained approximately equal numbers of males and females.

TABLE 4.—Feed consumption of turkeys of different types raised to market age in flocks of males and females in approximately equal numbers

Variety	Management	Feeding period	At end of feeding period—		
			Average live weight	Feed consumption per bird	Feed consumed per pound of live weight produced
		<i>Weeks</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Standardbred Bronze.....	Range.....	0-24	16.34	64.3	3.93
Broad Breasted Bronze.....	Range.....	0-24	18.41	67.8	3.68
Broad Breasted Bronze.....	Confinement.....	0-24	17.22	75.8	4.40
Beltsville Small White.....	Range.....	0-24	11.89	52.6	4.44
Beltsville Small White.....	Confinement.....	0-24	11.36	56.5	4.98
Standardbred Bronze.....	Range.....	0-26	17.65	73.5	4.17
Broad Breasted Bronze.....	Range.....	0-26	19.40	76.6	3.95
Broad Breasted Bronze.....	Confinement.....	0-26	18.40	85.6	4.65
Beltsville Small White.....	Range.....	0-26	13.14	59.5	4.53
Beltsville Small White.....	Confinement.....	0-26	12.41	63.5	5.20
Standardbred Bronze.....	Range.....	0-28	18.50	86.6	4.68
Broad Breasted Bronze.....	Range.....	0-28	20.36	89.5	4.40
Broad Breasted Bronze.....	Confinement.....	0-28	20.05	98.3	4.90
Beltsville Small White.....	Range.....	0-28	13.64	66.1	4.84
Beltsville Small White.....	Confinement.....	0-28	13.11	72.9	5.56
Standardbred Bronze.....	Range.....	0-30	19.00	92.5	4.87
Broad Breasted Bronze.....	Range.....	0-30	21.50	98.9	4.60
Broad Breasted Bronze.....	Confinement.....	0-30	21.00	109.2	5.20

The amount of feed required to produce a pound of live weight is given. These data were compiled from several experiment station reports.

RANGE REARING OF TURKEYS

Turkey poults may be put into rearing quarters from the brooder house when they are from 6 to 12 weeks old. Turkeys may be put in confinement rearing quarters as early as 6 weeks. If range shelters are provided, 8 weeks is the best time to make the change unless black-head is prevalent. If shelter on the range is not provided, or if black-head is prevalent, it is safer to delay the transfer until 11 or 12 weeks when the poults are larger and in better shape to withstand storms, blackhead infection, or other adverse conditions. Any well-drained grass or legume pasture makes a good rearing range. Poorly drained areas should be avoided at all costs. Sandy soil is an advantage but if natural drainage is good, heavy soils make good range.

Shade is desirable in any climate; where weather is hot and sunny, it is a necessity. The best shade, from the standpoint of sanitation, is a wire- or slat-floored range shelter with a wire-enclosed droppings pit. Scattered trees and bushes provide good shade as do rows of Sudan grass, corn, or sunflowers. Portable shades, made of a framework of poles or lumber and fencing wire, covered with marsh hay, straw, cornstalks, or similar roughage or slabs of wood, sheet metal, or overlapping boards, also are satisfactory. Simply constructed range shelters consisting only of roof and roosts are in common usage and make good shade; they may be moved frequently along with the other equipment. Such shelters may be drawn together in a row or semi-circle in the late fall to provide shelter from storms.

The most widely practiced method of utilizing range is called the

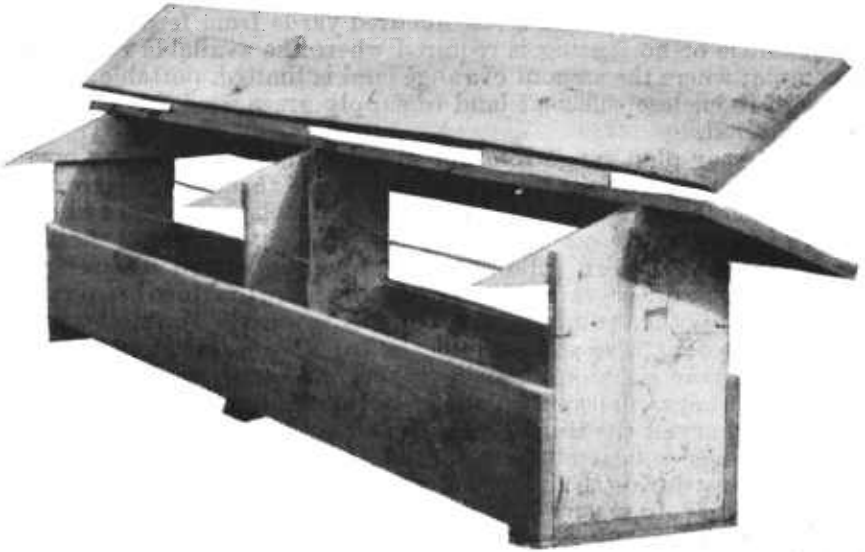
Minnesota Plan, the outstanding feature of which is moving the turkeys and their equipment to an adjacent clean location frequently, once a week being the most common interval. Where feed and water are kept before the birds at all times, an almost universal practice, they do not range farther than a few hundred yards from feed and water, hence little or no fencing is required where the available range area is ample; where the amount of range land is limited, portable fencing enough to enclose sufficient land to supply green feed for a week or so is desired.

The 4-year plan range rotation works well where farming operations are combined with turkey raising. The turkeys are grown the first season on a range seeded the same or previous year to some suitable range crop, and are moved to adjacent clean range weekly throughout the season. Corn follows the turkeys the second season; then wheat or some other grain, or perhaps corn again, the third season; and finally some other suitable crop, such as soybeans, grass, clover, or alfalfa the fourth season, going back to turkeys the fifth year. A suitable 3-year rotation consists of turkeys, corn, small grain, and back to turkeys, planting the range to the desired forage crop after the grain harvest the third year or in the early spring of the fourth. In such range rotations, the turkeys fertilize the land which results in good crops during the intervening years. Where the available range is ample and is used only for turkeys and perhaps cattle, a range permanently seeded with a suitable grass or legume or a mixture of the two is best, using any given area 1 year in 3 and, if practicable, cutting the green crop for hay or pasturing it with cattle during the intervening 2 years.

Under more favorable conditions moving is done less frequently, varying from every 2 weeks to only once every 2 or 3 months. In fact, in sunny climates on exceptionally well-drained locations, turkeys may be ranged in the same area throughout the growing season, but this practice is decidedly risky in many turkey-raising areas of the country. If it is attempted, the turkeys should be housed in a range shelter providing wired-in roosting quarters and wire-floored or otherwise contamination-proof feeding and watering facilities. If all roosting, watering, and feeding operations are carried on under strict sanitation, and care is taken to see that the range area drains well, the same range area may be used each year even in sections where rainfall is abundant. However, the use of portable equipment that allows frequent changes in location is safer and to be preferred, especially where turkeys are reared in large flocks. It is important in all rearing operations that the drinking water be fresh and clean, the containers washed and rinsed daily, that the droppings and moisture are not allowed to accumulate around the waterers, and that the turkeys do not have access to stagnant water pools or other possibly contaminated sources of water.

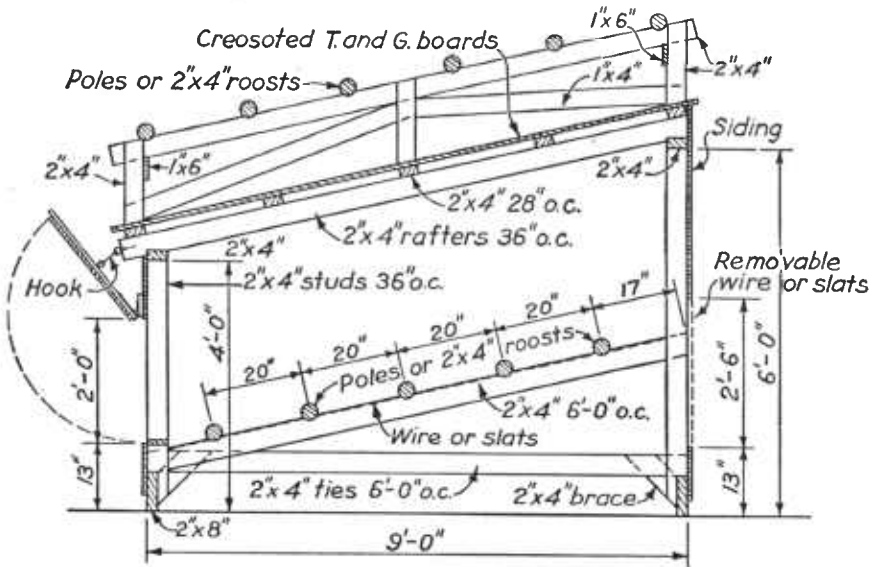
Where range land is definitely limited, turkeys are sometimes reared in permanent yards and buildings, but this is a dangerous practice under any but the most favorable soil conditions. With a permanent yarding system it is especially important to do all feeding and watering on wire or slat floors and to see that very good drainage is maintained in all sections of the range, no damp spots being permitted. There may be some advantage in using three to five yards

alternating them every 4 weeks through the growing season. With two or more yards, the birds are fed, watered, and roosted inside the shelter so that alternation of yards is accomplished merely by open-



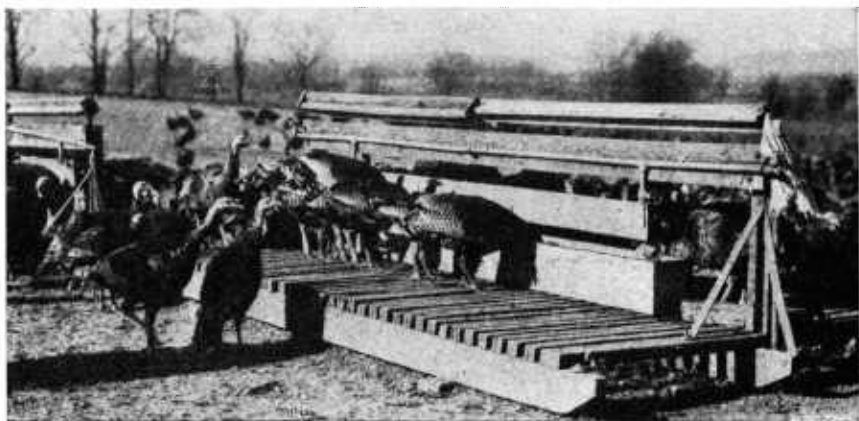
59908-B

Figure 23.—Trough-type covered range feeder. Sides, bottom, and roof are of 1' x 10' boards. Skids may be placed under this feeder for easy moving, and poles or boards laid alongside on ground so small turkeys may reach the feed.



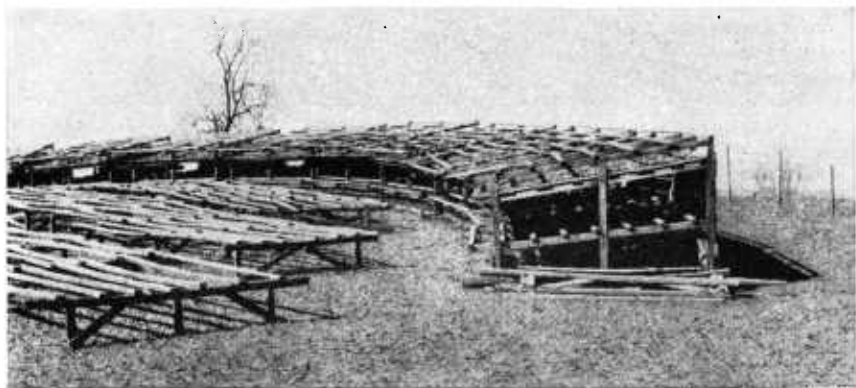
CROSS SECTION

Figure 24.—End elevation of a 9' x 26' range house for 125 turkeys under the roof and 125 more if roosts on top are used. (Blueprints for this building are available upon request.)



80351-B

Figure 25.—Portable range waterer, valve-controlled with rubber-hose connection.



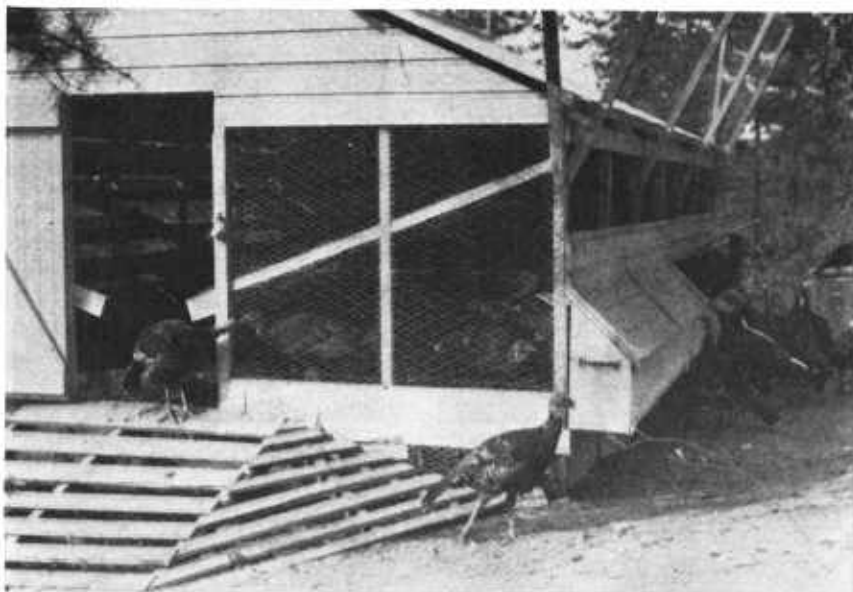
80366-B

Figure 26.—Open roosts and range shelters arranged in a semicircle for storm protection.

ing the proper exit and closing the others. Figures 23 to 28 illustrate various feeders, waterers, and range houses. Detailed plans for range houses are given in a mimeograph, AHD-48, available from the Bureau of Animal Industry, Beltsville, Md.

SIZE OF RANGE UNITS

Up to 3,500 turkeys can be raised successfully in one range rearing unit under favorable soil and climatic conditions. Smaller numbers are preferable; larger numbers are risky. A good practical range unit is 2,000 birds under most conditions of soil, climate, and management. On well-drained range in sunny, dry climates, the larger units of 2,500 to 3,500 are practical. One attendant can care for that many turkeys, including hauling of feed and water, moving of equipment, and guarding the turkeys. More birds, possibly up to about 5,000, may be serviced by one man if labor-saving devices, ready-mixed feed, adequate transportation, well-arranged equipment, and some assistance at critical periods is available.



59899-B

Figure 27.—A portable range shelter of light weight 12' x 20'. If turkeys are fed inside, as in this illustration, a wire or slat floor is necessary. If fed outside, 1½" mesh 18-gage fox wire may be nailed loosely over the roosts and down to the narrow center walkway which may be floored with slats. Roosts may be placed on roof as shown in figure 24.



80914-B

Figure 28.—A flock of 2,500 Beltsville Small White turkeys on range in Virginia. Portable range shelters provide shade and protection; large capacity feeders minimize labor in feeding.

In planning a range rearing project, from one-half to 2 acres of fairly good range land should be provided for each 100 turkeys. Where permanent yards attached to a permanent range shelter are used every year, 100 turkeys can be grown on one-half acre of good pasture or 200 per acre; where a 3-year rotation with portable equipment is used, 100 turkeys need about 1½ acres, or 67 birds per acre; where a 4-year rotation is used, 100 turkeys need about 2 acres or 50 turkeys per acre. The above figures apply to well-watered range producing a good crop of green feed throughout the season. On semi-arid or other poor range producing a limited quantity of green feed, these allowances should be increased, possibly doubled or trebled.

RANGE CROPS

The crop grown on the turkey range will depend on the climate, soil, and the nature of range management. Permanently seeded ranges are becoming more popular and generally are best where range areas are limited. Where 3- or 4-year crop rotations are practiced, legume or grass pasture is popular, as are also annual range crops such as Sudan grass, sunflowers, soybeans, vetch, timothy, rape, and kale. Sunflowers and Sudan grass provide both feed and shade and sometimes are sown in strips between areas of other range crops. Combinations of two or more annual crops, which provide ample green feed throughout the season sometimes are desirable.

For permanent range, alfalfa, ladino clover, bluegrass, brome grass, and orchard grass rank high. Other satisfactory pasture plants are Bermuda grass, Dutch clover, redtop, and ryegrass. Mixtures of some of these plants often are desirable, the choice depending upon local conditions of soil and climate. Where alfalfa grows well it is an excellent pasture crop. Ladino clover recently has come into great favor in sections where it does well. It requires fairly well-watered soil. Bluegrass is one of the best pasture plants for turkeys in areas receiving sufficient summer moisture to keep it growing. Crops not suitable for turkey range are the sweetclovers and lespedeza, except the sericea variety, because the turkeys do not eat them well. Qualities desired in a permanent pasture are long life, resistance to trampling, and the production of green feed throughout the turkey growing season.

HERDING AND BEDDING

Turkeys possess a strong flocking instinct and can be driven about and controlled very successfully in much the same manner as sheep. The turkey herder, who may be accompanied by one or two dogs, takes charge of the flock and stays with it day and night. He feeds, waters, and guards the birds from about 8 weeks of age to marketing. A flock of up to 3,500 birds or even more under favorable conditions can be handled by one herder. With this method of management, maximum use can be made of range, and areas can be utilized that would otherwise be inaccessible with the other methods of management. Herded turkeys, particularly the heavy varieties, often are bedded rather than roosted, the only roosts needed being a few low anchor roosts made in portable sections. These are used to settle the birds for the night in the desired location, which is changed weekly or more often. This type of management is practiced only in mild, dry weather, and in well-drained locations.

PROTECTION AGAINST PREDATORY ANIMALS AND THIEVES

Dogs, foxes, and coyotes cause heavy losses among turkeys in many areas. Dogs are a menace in almost any location and range houses must be well constructed to exclude them. Wire of 16- to 18-gage weight is necessary and must be very tightly nailed. The 16-gage weight in 1½-inch mesh or wire of equal strength, should be used on the outside of building openings when they are located close to the ground. Confining the turkeys to their shelters all night and through the early morning hours frequently is necessary and where this is

done the turkeys should be fed and watered inside to increase the daily feeding period and reduce feather picking. Fences offer considerable protection from predatory animals of all types, but it is not practicable to make a fence completely proof against dogs, coyotes, and foxes that are determined to enter the premises. These animals must be trapped or a continuous guard maintained. However, well-fenced areas seldom are entered by these animals. Well-trained watchdogs give good protection particularly if tethered near the roosting areas or allowed to range over it.

High roosts provide protection at night, but not in the early morning hours when turkeys are off the roosts. Cannonball flares, free swinging lanterns, or electric lamps about 30 feet apart in a double row and completely surrounding the roosting quarters give excellent protection during darkness, but may be of little value after dawn. A rotating electric light beam has been reported to give good night protection. However, a continuous guard may be the only sure protection against predators and thieves in many locations.

Great horned owls and certain large hawks sometimes cause appreciable losses among turkeys roosting in the open. These birds and other predators often may be trapped by placing a steel trap on top of a tall pole or dead tree or several traps around a kill to which the culprit may return. More often it is necessary to maintain a watch and shoot the culprit.

HOUSES AND FENCES

In many of the Northern States, particularly North Dakota, South Dakota, Minnesota, Wisconsin, Iowa, and Nebraska, shelter for all turkeys held on range beyond November 1 is considered necessary in order to guard against excessive losses from storms bringing sleet, snow, high winds, and extreme cold. The range houses shown in figure 28 are adaptable to this purpose as they can be drawn together to form a long roosting shelter to protect against winds and drifting snow. Snow fences strategically placed offer considerable protection in preventing snow from drifting into the shelters. Large, permanent roosting shelters, usually partitioned to include not over 200 birds per section, are used in some locations to give the turkeys this late-fall protection from bad weather, the birds being moved in from the portable range equipment in October. When these large shelters are used during warm weather, soil sanitation is difficult to maintain except in extremely well-drained locations, in which case two or three yards may be attached to the shelter.

Where permanent shelters are needed, a more elaborate structure having a feeding and watering alleyway with a wire or slat floor and droppings pits wired off, is practical. The feeding and watering alleyway should be about 5 feet wide, which allows 1 foot for the feeding trough and 2 feet on either side for the turkeys. With this equipment the flock may be fed and watered inside and the floor kept sanitary. Capacity of shelters may be determined by allowing 2½ linear inches of feeder space per bird and about 12 inches of roost space for each bird of small type, 13½ inches for birds of medium type, and 15 inches for birds of large type.

A permanent house should, as a general rule, face in a southerly direction. Board sides on the north, west, and east ends, depending

on the direction from which storms are most likely to come, are desirable. Practically open-air conditions, combined with this protection may be obtained by leaving wire-covered openings 2 to 2½ feet wide across the north, west, and east sides at about the level of the roosts. Where snowstorms are expected, these openings should be equipped with board doors that may be closed in stormy weather. The south side may consist of 1-inch hexagonal mesh 18-gage or 1½-inch mesh 16-gage wire and only enough boards to give necessary strength to the building.

The construction of roosts is described in detail under Equipment for Breeding Stock. Where a wire-enclosed droppings pit and feeding and watering alley are used in permanent buildings, the droppings may be allowed to accumulate throughout one or two entire growing seasons without cleaning. This saves labor and preserves the fertilizing qualities of the manure.

A practical method of floor construction for range houses is to make the floor in removable sections each about 5 feet square. Framework may be made of 2 by 4's or similar material placed on edge with the top edge beveled to present about ¾-inch of surface. The center supports may be of 1 by 4's also placed on edge spaced 12 to 16 inches apart and laid lengthwise of the alley. This floor section should be covered with 1- by 1-inch wood slats placed 1 inch apart; with 1- by 2- or 1- by 4-inch 11- to 12½-gage welded wire; 1-inch hexagonal mesh, 16-gage galvanized wire; or with 1-inch mesh hardware cloth made of 11- to 12½-gage wire. The wire may be fastened with 8-penny nails and 1-inch staples to the top or sides of the outer framework but not to the center supports. The sections should be set loosely in the alleyway and held 1½ inches apart by large nails driven into the sides of the framework. Supports for the floor sections may be made of 2- by 4- or 2- by 6-inch material placed on both sides of the alleyway directly under the outer framework of the floor sections and blocked up so as to hold the floor frame 1½ feet above the ground.

Five-foot fencing is widely used to confine young turkeys of medium- or small-varieties, but 6-foot fencing is preferable for breeding stock. Portable fences of heavy-gage stock wire only 3 to 4 feet high have been used successfully to confine heavy turkeys. This lower wire is much easier to handle where frequent moving is necessary. Steel posts are in wide use and are preferred to wooden ones, especially in portable fences. In the more humid sections of the country, steel posts must be galvanized, but in the drier sections, painted posts are satisfactory.

CONTAINERS FOR FEED AND WATER

Small trough feeders (fig. 21, A) may be purchased or home-made for use from the first day in the brooder until the poults are about a week old. Such feeders are made of lath or similar thin material, about 1½ inches wide, with one piece for the bottom, two pieces for the sides, small sections for end pieces, and another for a guard to keep the poults out of the trough. These may be replaced by feeders also made of thin material, but about 2¼ inches wide, for use up to about 4 weeks of age. Larger feeders with sides approximately 5 inches high may be used up to 8 to 12 weeks of age, after which full-sized feeders are desirable. In order to provide facilities for beak-cleaning

(not needed where granules or pellets are fed), all feeders should be equipped with strong galvanized wire, preferably 11- or 12-gage, stretched inside the troughs as shown in figure 21. To prevent waste, trough feeders should not be filled to more than about two-thirds capacity. In the brooder house, the feeders may be kept on litter, which should be stirred and raked daily to prevent accumulation of droppings, or the feeders may be placed on wire platforms.

When feeding is done under shelter, trough feeders are suitable. No cover is necessary, but a guard to prevent contamination may have to be installed. For outside feeding, trough-type feeders generally are satisfactory. In climates with heavy rainfall, a cover should be provided to prevent serious wetting of the feed. Large, hopper-type feeders (figs. 13 and 28) that require less labor in distributing feed are coming into wide usage. No matter what type of feeder is used, about $2\frac{1}{4}$ linear inches of feeding space per bird should be provided.

During the first 2 or 3 days, fruit-jar waterers, 1 for each 25 or 30 poult, well scattered over the brooding room are excellent, followed by 2-piece tip-up, 2- or 3-gallon galvanized metal fountains, 1 for each 50 to 60 poult up to 3 or 4 weeks; or better, by troughs, about 2 inches deep and 3 inches wide, equipped with a valve that will automatically keep them full of water. After the poult are 8 to 10 weeks old, they will drink out of water pails, water tubs, good-sized wooden or metal troughs, or tin or granite-ware pans provided with wire or wooden guards to prevent contamination of the water and drowning of the poult. Where the water supply is ample and drainage for the overflow can be obtained, the bubbler type of waterer is best, since it insures a continuous supply of clean water and is easy to keep clean. No matter what type of waterer is used, contamination as a result of water spillage must be prevented either by setting the waterers on wire or slatted floors or platforms, over a dry pit, if necessary, or by moving the waterers at weekly intervals.

There are many types of watering devices available, and the grower should use his ingenuity in developing satisfactory equipment such as a watertight barrel provided with a drip faucet or an automatic valve to keep the trough full. In general, about one-quarter linear inch of watering space should be provided for each turkey over 8 weeks of age. In any event, contamination by droppings must be prevented by using well-designed equipment; sufficient facilities to prevent undue crowding at the waterers should be provided; and all waterers should be washed thoroughly with brush or cloth and rinsed with clean water daily.

REARING TURKEYS IN CONFINEMENT

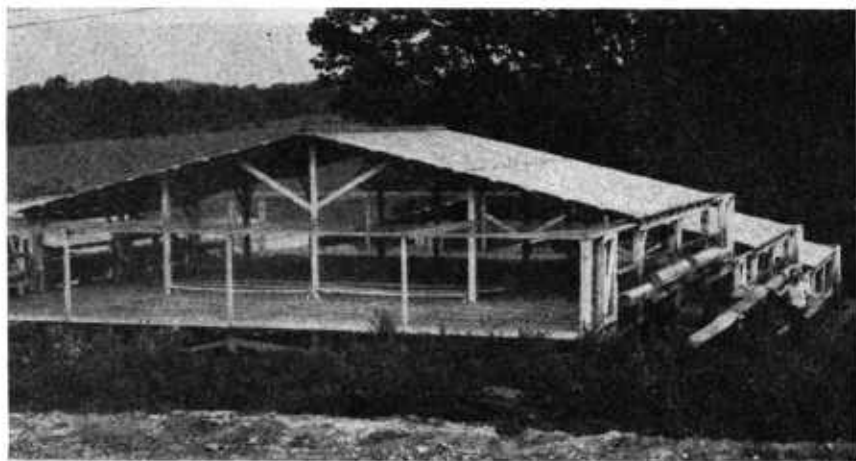
Raising turkeys in confinement, in restricted quarters entirely off the ground, is a new development which has been widely adopted in the Northeastern States and to some extent in all sections of the country. It is growing in popularity. Its chief advantage is less likelihood of losses from predatory animals, thieves, parasites, and soil-borne diseases such as blackhead. Good protection from the weather also is provided. Only a small area of land is needed, and the turkeys are concentrated under the direct control of the operator. Some of its disadvantages compared to rearing on range are higher costs for feed and equipment; more trouble from breast blisters, feather picking, and

foot and hock deformities; and more difficulty in supplying an adequate diet. The diet must be fully adequate, the birds must be allowed sufficient floor space, and the floor material and roosting devices must be selected carefully.

Turkeys of medium or small size are best adapted and the large types least well adapted to confinement rearing. However, all types may be raised successfully in confinement. For large-type turkeys the entire confinement quarters should supply about 7 square feet of floor space per tom and about 5 per hen, or an average of about 6 for both sexes raised to market age. Medium-sized varieties should have about $5\frac{1}{2}$ square feet and small-type turkeys about 5 square feet per bird in mixed flocks. On this basis, a platform 20 by 35 feet containing a roofed-over section 16 by 20 will provide rearing quarters for about 100 male large-type turkeys, or 140 hens, or 115 of both sexes. However, many growers are successful when only about 4 square feet of floor space is provided per bird. With less than about 9 square feet per bird, trouble may be experienced from feather and flesh picking. Methods for correcting this are given on page 70.

The equipment needed consists of a shelter attached to or made part of a rearing platform, with feeders, waterers, and usually roosts (fig. 29). Rearing platforms should be built up off the ground at least 4 and preferably 6 to 8 feet to allow space underneath for cleaning. Ground with a fairly steep slope frequently is chosen, as the building can then be firmly anchored close to or on the ground on the one side and the slope permits easy cleaning and natural air and water drainage. Feeding or watering, or both, can be done inside the platform, but this results in more wear on the floor and is not so convenient.

Supports for the shelter may be made of concrete or treated wooden piling, topped with a floor framework of rough-sawn, 2- by 6-inch material for the outer edges and 1- by 6-inch lumber placed 2 feet apart for the inside framework. Another method is to use planed



80247-B

Figure 29.—Confinement rearing house in Delaware built on three levels. The low roosts help to prevent leg, foot, and breast injuries. Feeders at right (shown inverted for cleaning) are filled from the elevated walkway. Water is furnished by bubblers with drains attached.

2-by-6's set parallel 24 inches apart resting on braced 3- by 8-inch girders (fig. 30). The 2-by-6's support the floor wire or slat flooring material with a minimum of cross supports. Beveling the top edges a little to present a top surface of three-fourths inch is a help in sanitation, but is not essential. Beveling to a sharp edge is undesirable.

The best floor materials for the rearing platform are 1- by 1-inch clear fir, cypress, or oak slats placed 1 inch apart. Such floors are suitable for turkeys of all ages and weights. Another is 1- by 4-inch mesh electric weld, galvanized, 11-gage wire laid smoothly and the joined strips laced at the selvage with 12- to 14-gage plain galvanized wire or with hog rings placed at close intervals. The wire is well nailed or stapled with 1-inch or longer poultry-wire staples to the outer edges of the platform, but not to the center supports, since this tends to break the wire. Other satisfactory flooring materials are wooden 1 $\frac{1}{4}$ - by 1 $\frac{1}{4}$ -inch, 1- by 1 $\frac{1}{2}$ -inch, or 1- by 2-inch boards, set flatwise 1 to 1 $\frac{1}{4}$ inches apart; 1- by 2-inch mesh 11- to 12 $\frac{1}{2}$ -gage welded wire; 1- by 1-inch square mesh 12- to 14-gage hardware cloth; or 1- to 1 $\frac{1}{2}$ -inch hexagonal mesh, 14- to 16-gage fox wire.

Slat floors are stronger and more durable than wire and are less conducive to foot and leg trouble, hence are better for large turkeys. Where the wire or slat floor is placed on top of a solid floor it may consist of standard welded-wire floor sections, preferably made from 10-gage wire 6 inches high and about 3 feet square with a walking surface of 1- by 1- or 1- by 2-inch mesh. However, floors made of these sections may become rough and irregular with use, especially where the caretaker walks on them regularly, and result in damage to the feet of the bird. The permanent floor described above is preferred. Frequently the inside covered portion of the platform is floored with wire, while the outside open portion is floored with slats which are easier on the feet of the birds and provide a better walking surface for the attendant, which is important if feeding or other activities are carried on inside the confinement quarters.



80912-B

Figure 30.—Framework for floor of confinement rearing house shown in figure 29.

Confinement yards floored to a 9-inch thickness with coarse sand, coarse gravel, cinders, or preferably smooth stones the size of chicken or turkey eggs are used successfully. About 12 square feet per bird is desirable. The surface should be harrowed at the beginning of each season and thin places built up with clean material. With sand or cinders it may be necessary to replace part or all of the top 2 or 3 inches with clean material each season and occasionally stir or rake it during the growing season. The roosting section should be wired in, to provide a droppings pit which the turkeys cannot get into.

Sidewalls of the rearing platform should be from 6 to 7 feet high. Ordinary heavy-weight, square-mesh poultry fencing (top and bottom wires 11 gage, inside wires 14½ gage) is the most practical material for the side walls, though 1½-inch hexagonal mesh 18-gage or 2-inch mesh 16-gage netting is very good. When feeders and waterers are hung to the sidewall, a welded-wire grill 12 inches high, adjustable to 2-inch openings for use with birds 8 to 16 weeks old and 3 inches for older birds; or slatted grills with openings 2 and 3 inches wide, respectively; or a narrow-space grill adjustable to provide horizontal openings to suit various sizes of turkeys, should be placed in front of each feeder and waterer. For use in severe weather, the roosting section usually is boarded up on 3 sides with adjustable openings in the rear that can be closed against storms and opened in warm weather for ventilation and light to encourage the use of the roosts. In moderate climates, little or no sidewall protection is needed, the roof being sufficient.

The top of the open portion of rearing platforms may be left open but better protection is given if it is covered with ordinary medium-weight square mesh poultry wire or with 2-inch hexagonal mesh, 18-gage netting (fig. 31). If the top is left open, the sidewalls should be 7 feet high and the flight feathers of one wing of the turkeys clipped or the last joint cut off as described on page 63. By adding a 2-foot slanted-in, woven-wire antitfy to the top of a 6-foot fence, the need for clipping probably would be eliminated especially with large-type turkeys.



80246-B

Figure 31.—A small-scale confinement rearing shelter which provides shade, protection, and a sanitary environment. End view is shown in figure 32.

The roofed-over section (fig. 32) can be covered with overlapping clear boards, galvanized metal or aluminum roofing, roofing paper on sheeting, used paper-mill belting on top of sheeting, or some of the newer, processed roofing materials requiring no supporting sheeting. In each case the roof should have proper support and sufficient pitch. The roofed-over section should provide 12 linear inches of roosting space per bird for small-type turkeys, 13½ inches for medium types, and 15 inches for large-type turkeys, and if birds are to be reared in severe weather, sufficient protected space should be allowed to accommodate feeders and waterers along with sufficient space for the birds to use the equipment.

Roost construction is described in detail on page 25. The roosts may be built in the center of the platform or against the edge. If placed in the rear of an enclosed shelter, provide openings that can be closed in bad weather; keep them open in mild weather. Low roosts are a necessity with large broad-breasted turkeys and highly desirable with other types. These roosts are built all on the same level, their tops 4 to 6 inches above the floor. If it is necessary to have the tops of roosts more than about 8 inches above the floor, it is an advantage to nail strong wire, preferably 2- by 2-inch square mesh 14- to 16-gage, or 1½-inch hexagonal mesh 16-gage, loosely over the tops of the roosts or tightly to their undersides to support the birds and thus prevent bruising and other injuries. Welded wire 2- by 4-inch mesh, 12½- to 14-gage, may also be attached to undersides of the roosts, or slats may be used between the roosts, for this purpose. With this arrangement, the roosting section would not require any floor wire or slats, the wire on top or underneath, or the slats between the roosts serving the purpose of the wire or slat floor. Wire or slats on top of or attached to bottom surface of the roosts are self-cleaning whereas materials placed 5 inches or a greater distance below the top surface of the roost are not.

Feeders may be of the reversible, single-sided, hanging, trough type filled from the outside or they may be of the trough or hopper type, double sided, which usually, but not necessarily, are placed under



80250-B

Figure 32.—End view of small-scale confinement rearing shelter in Massachusetts.

the roof of the shelter. For each bird, 2 to 2½ linear inches (depending on the type of turkey raised) of feeder space should be provided. Bubblers with drains attached probably are the best type of waterers for use in confinement rearing. One of these is sufficient for each 100 to 140 birds. They are frost-proof, sanitary, and labor saving. They must be kept carefully adjusted to prevent waste of water; water pressure must be uniform; and drains to carry out the overflow must be provided. To make them proof against zero temperatures, the incoming water pipes and the drain pipes must be insulated. Trough waterers controlled by automatic float valves also are popular. Where necessary, insulated or heated waterers may be used.

Ordinary metal or wooden troughs, buckets, or barrels properly guarded to prevent contamination and drowning may be used, but require more labor to keep them clean and to supply the large quantity of water needed. All waterers should be kept clean by daily washing with brush or cloth followed by rinsing in clean water. Occasional disinfection with chlorine or quaternary ammonium disinfectants, sodium orthophenylphenate solution, or other disinfecting solutions not leaving a strong odor may be indicated if disease is present. However, cleanliness alone usually is sufficient.

EARLY DEVELOPMENT AND SEX DETERMINATION

Poults when first hatched are covered with soft down and have about 16 short, stubby wing feathers on each wing, but no tail feathers. By 2 months of age, they are well feathered, having molted part of their first crop of wing and tail feathers and replaced them with adult feathers. At about the fifth week fleshy protuberances begin to appear on the head and by the seventh week, they begin to extend down the neck; this is termed "shooting the red," and is a natural development of no particular significance. On top of the head of both males and females, a fleshy protuberance develops into what is called the tubular leader or snood. On males the snood is relatively large, plump, and elastic, whereas on females, it is relatively small and thin. The young males frequently strut at the day-old stage and from then on indulge in this characteristic male behavior to a greater or lesser extent throughout life. Well-grown healthy males strut almost continuously throughout their lives. Failure to strut is a sign of off-condition. Young females rarely strut, but mature females do occasionally.

The beard, a tuft of hairlike feathers, appears on the breast of males between 3 and 4 months of age. Occasionally females have beards which are shorter, finer, and have fewer hairs than those of the males. The hock joints of males are much broader, heavier, and more flattened in front than those of females. The heads of males are coarser and broader and the headgear is redder than that of females.

Also there are differences in the breast feathers of males and females of several varieties so that sex may be determined when the mature feathers appear at the age of about 12 weeks. In Bronze poults the breast feathers of the male are bronze-black with no white, whereas the tips of those of the female have a narrow white edging. Narragansett poults show the same sex differences in plumage. Wild turkey females have breast feathers with iodine-colored tips, which are lacking in the males. Bourbon Red and Buff females have white-tipped breast feathers while those of the male are black-tipped.

The sex of day-old poult may be determined by examining the vent. The principle is the same as with chicks, and as with chicks, both study and practice are required in order to obtain accuracy and speed.

MARKING

A permanent method of marking turkeys is often needed to separate birds of different ages and breeding. Marking may be done easily by punching a hole in the webs between the toes or slitting these webs with a sharp pair of shears. If toe punching is used, the plug of flesh produced by the punch must be removed completely, otherwise the punch mark may grow shut. Fifteen different combinations of punch marks or slits are possible, using both webs of both feet.

Wing banding is the best method of marking and is necessary in pedigree breeding operations. For this, aluminum or aluminum alloy bands of rectangular or circular shape are in common usage. Unless a permanent seal is required, the double-clinch type of band is preferred since such bands may be removed easily when it is necessary for any reason to replace them or change their location. Wing bands may be applied in two ways. First, the band is rounded and clinched then slipped over the baby poult's foot and flattened so that it will not come off, but at the same time will allow for growth of the leg. Each band should be tested to be sure it will not come off, yet allow for about 2 weeks' growth. The birds must be handled at the age of 2 to 3 weeks and the bands loosened slightly to allow for another 2 weeks' growth or, to save handling, may then be put into the wing. The transfer is made by unclenching the band and inserting it in a hole cut near the middle of the wing web between the first and third joints and approximately three-sixteenths inch from the edge of the web. The band is again clinched and made round or elliptical.

With the second method, the band is put directly into the wing at hatching time, using a small, thin, sharp knife blade or better, a small, thin-bladed, botanical scalpel to make the hole a little longer than the band is wide and exactly three thirty-seconds of an inch back from the edge of the web and midway between the first and third joints of the wing. Only by very careful placement of the slit, as directed, can trouble be avoided. Circular wing bands should be nine- to ten-sixteenths inch in diameter inside measurement when made round, but when placed directly into the wing at hatching time, must be flattened so that the center portions of the band touch each other. This prevents the band from slipping around the wing. At about 4 to 8 weeks of age, the bands must be opened up to allow for wing growth leaving the band round or elliptical-shaped. The rectangular-shaped wing band should be about 1 inch long inside measurement and, to prevent slipping around the wing tip, should be pressed together at the center when put on the day-old poult, then opened up to full size later, usually at about 8 weeks. Wing bands of all types should be one-fourth inch wide and made of fairly stiff aluminum alloy with legible figures five thirty-seconds or three-sixteenths inch high. All wing bands require attention early in the growing period, usually at about 8 weeks, to avoid loss of bands and festering or deformity of the wing.

Tattooing of the wing web is a good method of permanent identification, but is not practicable until the birds are about 2 months old.

Metal leg bands are a practical means of identification for breeding birds. Bands should be strongly constructed and of proper size for the size and sex of the bird.

PREVENTION OF FLYING

Hen turkeys of all types and toms of the medium- and small-sized varieties fly well and sometimes it is necessary to clip the large outer flight feathers, or primaries, of one wing to prevent extensive flying. However, this will not prevent the birds from getting on top of a building or a solid-top fence that is less than about 8 feet off the ground. Antiflies, constructed of lightweight poultry fencing, supported by 2- by 2-inch boards or by lightweight angle iron, should be placed on top of buildings, on solid-top gates, and often on the fences themselves for 2 or 3 rods out from the buildings.

Wing feathers may be clipped with sharp heavy shears, with sharp lightweight tinsnips, with hedge clippers, or with a sharp hatchet and chopping block. With small-type turkeys, where flying must be prevented, it is good practice to clip one wing of both hens and toms at the time the birds go on range and again at about 16 weeks of age. If kept for breeding, the hens, but not the toms, should be clipped again at market age. With heavy turkeys, it is best to clip one wing of both males and females when put on range and clip the females again at about 16 weeks. Toms that are to be kept for breeders never should be clipped prior to the breeding season as this throws them off balance and interferes with mating. If clipping of toms is necessary, clip both wings lightly.

For permanent and almost complete prevention of flying, the entire terminal segment, or metacarpal joint, of each wing (corresponding to the hand in human anatomy) may be clipped off, using sharp strong shears (surgical shears are excellent), and making the cut just a little way out from the last joint of the wing so as not to damage the joint, yet remove nearly all of the segment that bears the pinion and flight feathers. Turkeys so treated, at the age of 4 to 7 days, never develop any primary (flight) or pinion feathers and tend to be more quiet since they are unable to fly, yet they are able to handle themselves well otherwise. Another advantage is that they are easier to pluck when they are dressed for market. In small-type turkeys at least, mating is not hampered as a result of this treatment.

COMBATING DISEASES AND PARASITES ²

For best results, turkey raisers should follow some effective system of sanitation. Many growers have prevented disease and the attacks of parasites in their young turkeys by (1) providing range on naturally well-drained and clean soil, that is, soil on which no poultry manure has been deposited for 2 to 3 years; (2) moving the growing turkeys and their equipment to an adjacent clean area every week or two throughout the rearing season and using the same area only 1 year

² Further information concerning poultry diseases may be obtained from Farmers' Bulletin 1652, Diseases and Parasites of Poultry, issued by the U. S. Department of Agriculture.

in 3 or 4; and (3) feeding and watering the birds from equipment that cannot be contaminated by droppings, and keeping the areas around feeders and waterers dry and clean at all times either by moving frequently or using wire-covered or slatted platforms or grills.

Separation of the turkeys from chickens and other poultry at all times is essential. Separation of old and young turkeys likewise is essential. Separation from all kinds of livestock except horses and cattle is desirable. By separation is meant not only actual physical segregation, but the prevention of soil contamination through manure. In other words, other livestock, except horses and cattle, should not use the turkey range within 2 or 3 years before it is used by the turkeys. Avoiding the introduction of diseases and parasites via introduced stock and by persons and equipment is an important preventive measure.

Young turkeys are susceptible to filth-borne diseases, such as coccidiosis, hexamitiasis, and blackhead which often cause heavy losses. Brooding on wire floors discourages these diseases. Where litter is used it should be kept dry and either built up or else changed weekly. Raking off the surface droppings daily and using wire-covered feeding and watering platforms will aid in sanitation. Many flock owners rear turkeys to maturity in strict confinement on wire or slat floors so as to reduce losses from parasites and filth-borne diseases to a minimum. Mycosis and trichomoniasis affect the crop and are filth-borne diseases that may affect turkeys later in the growing season. Pullorum disease, typhoid, and paratyphoid are diseases transmitted through or on the egg or spread by hatching the turkey poults with infected chicken or turkey eggs or growing them along with infected chicks or poults.

Control of these diseases is best effected by blood testing the breeding stock and hatching only eggs from disease-free flocks in clean incubators. Complete separation of young and old stock and prevention of its introduction by infected birds, equipment, or persons will help to prevent sinusitis, or swellhead, in particular, and other diseases in general.

Fowlpox affects turkeys of all ages. It is the only turkey disease that can at present be controlled successfully by vaccination. If pox is present on the premises, young stock should be vaccinated with fowl-pox vaccine sometime between 2 weeks and 4 months of age or in time to immunize the flock against the expected outbreak of pox, allowing 30 days for immunity to be established. If turkeys are kept for breeding, they may in the warmer sections of the country have to be vaccinated again not less than about 6 months after the first vaccination. Pox vaccination of breeding stock is widely practiced because the financial loss due to a pox infection in an unvaccinated flock during the breeding season always is great. Turkeys are subject also to the attack of various species of roundworms and tapeworms, but treatment should not be undertaken until the presence and identification of the worms have been determined by examining the droppings or by post mortem examination. Worm infestation can be prevented by sanitation and by the control of intermediate hosts, such as flies, grasshoppers, beetles, and other insect carriers.

Very few diseases and parasites can be controlled successfully by medication. Prevention is the more practicable and profitable method.

BLACKHEAD

Although other infectious diseases now are established in turkeys and cause heavy losses, blackhead is still a destructive and widespread ailment. It is caused by a protozoan (*Histomonas meleagridis*) and is primarily a disease of the ceca (blind pouches of the intestines) and the liver, but the fact that the head of the infected bird sometimes becomes dark-colored has given the disease its common name, blackhead. It attacks both chickens and turkeys, but chickens usually are affected by it without showing symptoms, thus the chickens carry and spread the infection to turkeys when both are allowed to mingle or range over the same ground. A combination of spotted liver and ulcerated ceca indicates that the birds have blackhead infection.

Although blackhead may affect turkey breeder hens (seldom breeder toms) midway or late in the breeding season, it causes the most damage in poults between the ages of 6 and 18 weeks. It is found everywhere in the United States, but is harder to control in sections where rainfall is abundant and soil drainage poor. Turkeys affected by blackhead, like all birds having infectious diseases, *should be removed immediately* from the flock to prevent spread of the disease. In case of an outbreak, the best procedure is to isolate, on wire or slats, the obviously sick birds by going into the flock shortly after daybreak, then move the well birds to wire- or slat-floored quarters. Bury, burn, or place in a deep disposal pit, the bodies of those that die.

If wire- or slat-floored quarters cannot be provided, move the remainder of the flock and its equipment to clean ground daily for 2 weeks, then twice weekly for 3 weeks after which weekly moves until market time should suffice. Another method is to take the birds off the ground, clean out the shelters; wire in the roosts, place waterers and feeders on wire or slats, and put the birds on clean litter adding new litter daily for 2 weeks, then twice weekly for 3 weeks, and finally once each week until market time. Contaminated ground should be abandoned for at least 3 years. Confining the birds to wire- or slat-floored quarters will help to overcome an active infection and prevent further infection. Where this can be done, it is the best method of control. Up to the present time successful medication has not been discovered. Prevention is the only control that is economically sound and at best medication even if successful would be valuable only as an emergency treatment.

Keep chickens and other poultry away from turkeys at all times; also keep mature turkeys away from the young ones. The organisms which cause the disease may be carried by flies, blown about with dust, conveyed in contaminated soil on the feet of the caretaker, or carried for considerable distances in other ways. The cecal worm, *Heterakis gallinae*, aids in the spread and maintenance of the disease organisms and should be controlled where it is demonstrated to be present in considerable numbers. However, blackhead may be spread widely without the aid of the cecal worm and the elimination of it is no guarantee that blackhead control will be effective. The methods of control recommended above also will aid in controlling the cecal worm along with other parasites and soil-borne diseases. Feeding and watering the turkeys on wire or slat floors and eliminating all damp places in the yard are important aids to sanitation especially where permanent

yards are used. Weekly moving of the growing flock, along with all the rearing equipment, is widely practiced as a means of controlling blackhead and other filth-borne diseases and parasites in range-grown turkeys where climatic conditions favor their development.

Most of the well-watered turkey-growing areas of the Pacific Coast States, the Midwest, the East, and the South are in this category and it is in these areas where confinement-rearing in lieu of range growing often is practical. In locations unfavorable to disease and parasite growth, cleanliness and dryness around feeders, waterers, and roosts, along with separation from old chickens and old turkeys may suffice. The relatively dry areas of the Southwest and the well-drained slopes of some of the mountain and Atlantic Coast areas are in this category.

The administration of phenothiazine may be of value where the presence of cecal worms is demonstrated. One percent in the growing mash for a week should remove the majority of the parasites. After this, to avoid heavy reinfestations, the continuous feeding of 4 pounds per ton of mash or weekly feedings of 1 pound per 500 birds in a day's feeding of mash should be effective. Treatment, however, is only a stopgap. If turkey raising is to be profitable, parasite-free range (managed to prevent development of cecal worms and other parasites), or slat- or wire-floored confinement quarters should be used.

LICE AND MITES

High mortality among hen-hatched or hen-brooded poults may result from infestations of head and body lice. When chicken or turkey hens are used for incubating and brooding, the hens should be pretreated with sodium fluoride. Apply this powder among the feathers, working it well down to the skin, one pinch on the head, one on the neck, one on the back, one under each wing, one below the vent, one above the vent, and one in the long fluff feathers on each side. If the hen has been treated in this manner a week before being set and the poults are not exposed to infested stock or premises, the poults should remain free from lice. Artificial hatching and brooding have practically eliminated lice from growing turkeys. It is well, however, to examine the poults occasionally, and if lice are found, apply sodium fluoride as directed, using it sparingly on small poults. If the turkeys are roosting in a house, nicotine sulphate solution may be used to control lice by applying a thin line of the liquid on the top surface of all roosts, being certain that all birds roost on the treated perches. This treatment is very effective and, where a general delousing is needed, it is the least laborious method.

Under commercial conditions, lice are a problem only among breeding stock and then as a rule only among the males as turkey hens usually succeed in keeping themselves free from lice. Breeding males should be examined occasionally, looking for body lice on the skin around the vent and for the feather lice in the long thigh feathers. In dark-plumaged birds, the large brown feather lice are difficult to see. Sodium fluoride applied by the pinch method probably is the best means of control, although the nicotine sulphate method is excellent if the males can be assembled in a group for the treatment. DDT insecticide powder is about as effective as sodium fluoride as a louse killer.

All chemical compounds effective as insecticides and sterilizing agents are more or less poisonous, particularly in undiluted state. Persons unfamiliar with safe methods of handling, mixing, and applying should secure expert advice before attempting to use these compounds. Avoid storage of poisonous substances.

In warm weather, dipping well-grown or mature turkeys in a tub of solution made by mixing one ounce of sodium fluoride to each gallon of lukewarm water is a very effective though somewhat laborious control. Immerse the bird only for a few seconds raising the feathers at the same time to allow the dip to penetrate through to the skin. Dip the birds on a warm day, preferably in the morning, so as to give them time to dry before night.

Red mites often flourish unsuspected in turkey roosting or nesting quarters, which should be inspected periodically. Their presence is indicated by grayish deposits or by the tiny mites themselves, which are red after they have been feeding on the turkey's blood. Mites may be destroyed by painting the underside of the roosts and roost supports with anthracene oil, crude oil, crankcase oil, or any coal-tar disinfectant. Make the application light but thorough, and do it preferably in the morning. If there are mites in the nests, apply the treatment there.

The fowl tick or blue bug is one of the worst pests of turkeys in the warm sections of the country. It is a large insect resembling a bedbug, and can be controlled by the methods advised for controlling red mites, but the treatment must be thorough and persistent.

DEFECTS, DEFORMITIES, AND VICIOUS HABITS

DEFORMED BREASTBONES

Severely crooked and deeply dented breastbones, or keels, cause turkeys to be reduced in grade on the market. A crooked keel is a sidewise (lateral) curvature or a combination of lateral and vertical curvatures whereas a roost dent is a vertical depression or dent. Faulty nutrition, mainly vitamin-D deficiency, and poor balance of the elements calcium and phosphorus, are believed to be the chief causes of these deformities. Feeding bonemeal in excess may be a contributing cause. Feeding balanced diets will prevent the occurrence of any considerable numbers of crooked breastbones. Disease, poorly formulated feeds, and mismanagement, may cause breastbone deformities to appear.

Heredity also may play a part, as some strains produce a certain percentage of crooked breastbones in spite of good feeding and management. Selective breeding will help to eliminate this type of deformity. Roosts narrower than $1\frac{3}{4}$ inches for turkeys over 12 weeks old may cause crooked or dented breastbones which occur more frequently in types of turkeys other than the broad-breasted, in which the heavy musculature seems to support the keels so that they rarely become crooked. Poles or half-rounds 2 to 4 inches across ($2\frac{1}{2}$ inches the ideal) make the best roosts for all types of turkeys and tend to prevent the development of dents and curvatures. Roost dents, unless very deep, cause little loss in market grade, but they detract somewhat from the appearance of the dressed carcasses. One of the com-

mon causes of dents in all except broad-breasted turkeys is a roost of sawed material over 3 inches wide laid flat. If the roost be tilted at a 15° to 20° angle, 1 foot rise in 4 of horizontal measurement, roost dents will be eliminated to a large extent.

CROOKED AND ROACHED BACKS

Severely crooked, or hunched, backs and roached, or arched, backs are of more or less infrequent occurrence and their causes are unknown. Possible causes are injuries and vitamin deficiencies early in life. Turkeys selected for breeding should be free from these deformities to prevent possible hereditary transmission of such factors.

BREAST CALLUSES AND BLISTERS

Calluses and blisters on the breast appear to be caused by injuries from flying or falling on hard objects, such as protruding nails, wires, or knots on the roosts or floors. Roosts that are too narrow, or smooth, wide slippery roosts, may cause the birds to slide around and bruise themselves. Birds forced to roost on the ground, on smooth wire or slat floors, or on pole roosts of the right diameter, not more than 6 to 8 inches from the ground, seldom develop these skin deformities to a serious extent.

BLUEBACK

Blueback results from a deposit of feather pigment in the skin of the backs of turkeys with dark-colored plumage. This condition is caused by injury to the developing feathers due to feather picking or, in breeding turkeys, to treading by the male, combined with the action of direct sunshine. Once deposited, this pigment cannot be eliminated except by preventing exposure to sunlight, a process which requires several weeks. When serious, blueback results in loss of grade on the market. White turkeys do not develop this condition because their feathers lack pigmentation. In young stock, prevention of feather picking and of mating before the birds are marketed will prevent blueback. In breeding stock, a certain amount of blueback sometimes on breast as well as on back, is regarded as a necessary evil, although the use of saddles on the hens reduces it considerably.

DEFORMED BEAKS

Cross-beaks are rare, but ostrich beaks (flattened and pointed) occur occasionally. Neither deformity is of economic importance, although the ostrich-beaked condition, if combined with infection, may cause losses. The causes are not known, but birds possessing them should not be selected for breeding. Ostrich beaks may be caused by an inadequate diet or more likely by beak injury due to reaching through wire mesh or rubbing beaks on poorly designed feeders or waterers. Pressure necrosis of the beaks of young poults appears to be caused by too finely ground, sticky feed which accumulates in the beak causing infection and deformity. Losses may be heavy. Properly formulated feeds will prevent it.

BUMBLEFOOT AND STAPHYLOCOCCOSIS

In bumblefoot, the foot swells and a horny callus appears, which causes lameness, retardation of growth, and sometimes loss of market grade. It is a deformity seldom seen in turkeys except those raised in confinement on wire. Heavy turkeys are most susceptible, although if the wire floors are rough, or the roosts too high, turkeys of medium or light weight may develop it. To prevent it, see that wire floors are smooth and free from projecting points, and build the roosts in such a manner that the turkeys cannot jump frequently onto a hard floor from a height of more than about 1 foot. Slatted floors seem to cause less foot trouble than wire floors.

An infectious disease called staphylococcic arthritis, or staphylococcosis, causes swelled feet and hocks which may be confused with bumblefoot; however, calluses are not found in connection with this disease. The swellings are soft and hot to the touch. This disease appears preventable by the methods suggested for the control of bumblefoot.

PEROSIS (DEFORMED LEGS)

Pérosis is a deformity of one or both legs, in which the large tendon on rear of the hock slips to one side, and a twisted shank results. Very often the hock is enlarged. The victim will invariably become lame and crippled. Perosis may affect day-old poults and is called spraddle-leg or it may occur in birds of any age up to about 30 weeks, after which new cases seldom develop.

The tendency towards perosis appears to be inherited and its occurrence may be reduced by selective breeding, eliminating all individuals and families having such tendencies. However, perosis may be caused by nutritional deficiency, commonest of which is deficiency of manganese or choline in the diet. Deficiency of vitamin D resulting in rickets or of vitamin G (riboflavin) also may cause it. Too much phosphorus may be an indirect cause of perosis, hence bonemeal and other high-phosphorus feed supplements never should be kept before the birds or included in the mash in larger quantities than are necessary to supply the relatively small quantities of this element needed in the diet. Turkeys raised on wire or slat floors are more likely to develop perosis than those raised on litter or on range. Prevention is the only control and this can be accomplished mainly by the feeding of a balanced diet, proper management, and eliminating susceptible families from the breeding stock.

PENDULOUS CROP

This deformity, sometimes called baggy, sour, or dropped crop, consists of a weakening of the crop and supporting tissues so that feed and water accumulate in the organ and pass out too slowly or not at all, resulting in a sour, ill smelling, semi-liquid accumulation of material. In the early stages, the crop contents are largely liquid and little tissue deterioration occurs. Later the contents become thicker and the lining of the crop becomes ulcerated and necrotic. Some natural recoveries occur, but birds badly affected usually die. Some strains or families of turkeys are more susceptible to pendulous crop than others. When these susceptible birds are exposed to hot weather

with consequent heavy consumption of water or milk, the deformity develops. Slightly affected birds should be given a chance to recover, but severely affected birds should be killed and, if the crop has not become necrotic, they may be eaten. Preventive measures include (1) selecting strains not carrying the genetic factor, (2) avoiding exposure of the turkeys to excessive heat, (3) giving free and easy access to cool drinking water, (4) providing ample shade, and (5) feeding no liquid milk, especially in hot weather.

IMPACTION AND PENETRATION OF THE DIGESTIVE TRACT

Impaction of crop, proventriculus (glandular stomach), gizzard, and sometimes the intestines, may be caused by the eating of coarse, fibrous feed or litter. Young poults most commonly are affected, but turkeys of any age may become impacted. Lawn clippings or other hand-fed green feed, if cut too long or allowed to wilt before eating, may cause it. Placing day-old poults on fibrous or other unsuitable litter is a common cause of this disorder which, if allowed to become prolonged, is almost always fatal. Penetration of the gizzard or proventriculus which usually is fatal often is caused by eating shiny nails, bits of wire or other metal, splinters from shavings or even hulls from coarsely ground oats or barley. There is no cure for impaction or penetration; methods of prevention are suggested by the causes listed.

Crop conditions superficially resembling impaction, but different in that the crop walls become thickened are caused by the fungous disease mycosis and the protozoan disease trichomoniasis of the upper digestive tract, and also by crop worms (*Capillaria*). Control in these cases may be effected to a greater or lesser degree by dissolving copper sulphate (bluestone) in the drinking water in 1:2,000 concentration, removing all other sources of water. The bluestone may be given over a period of several weeks if necessary as a control measure.

CANNIBALISM (FEATHER AND FLESH PICKING)

Feather picking is a mild form of cannibalism to which turkeys are very susceptible during the growing period, especially after they are about 12 weeks of age. It results in unsightly appearance, more trouble from pinfeathers when the birds are marketed, and blueback in dark-plumaged varieties. It rarely results in flesh picking and seldom becomes serious enough to retard growth rate.

As a rule, feather picking reaches serious proportions only in turkeys raised in confinement. It may be prevented or stopped completely by "debeaking" with an electric device which cuts off and sears the outer $\frac{1}{4}$ -inch or so of the upper beak and sometimes also the tip of the lower beak, or by a specially made turkey bit resembling a $1\frac{1}{4}$ -inch hog ring hanging between the two jaws and adjusted to fit snugly into the nostrils without penetrating the septum between them. This device prevents the beak from being closed completely, thus preventing feather picking. The debeaking should be done, or the bit applied when the trouble starts, usually at about 12 to 14 weeks.

Management practices that tend to prevent feather picking are: (1) Placing tightly stretched 11- or 12-gage wire on the feeders for beak-cleaning; (2) avoiding overcrowding in confinement rearing; (3) providing $3\frac{1}{2}$ to 4 inches of feeder space per growing turkey, rather than

the minimum allowance; (4) feeding an adequate diet; (5) feeding pelleted mash instead of mash in dry form; (6) allowing the turkeys access to corn fodder or baled legume hay; (7) feeding whole oats in fairly large proportion, about 50 percent of the grain portion of the standard mash-grain diet; and (8) not confining turkeys to roosts or restricted quarters, particularly in the early morning.

Head and neck picking occasionally results from fighting. Fighting usually is not serious among turkeys, provided injured birds have ample opportunity to escape. Seriously picked birds should be slaughtered and the meat utilized.

Pine tar or chick-pick remedies such as a mixture of 4 ounces of petrolatum, one-fourth ounce of carmine, and one-fourth ounce of aloes applied to the affected areas offer temporary relief from picking.

ABNORMAL FEATHERING

Rough, broken, or weakened feathers often accompanied, in dark-colored poults, by a bar of white across the wing, called achroma, apparently are the results of a deficiency of the amino acid lysine. Poults need 1 to 1.2 percent of lysine in their diet. Soybean meal is one of the few good sources of lysine and a diet containing about 20 percent of soybean meal will prevent achroma. A diet with about 14 percent of fishmeal also prevents it. Achroma in itself is seldom a serious disorder, but its occurrence indicates lack of protein balance in the diet, which is likely to result in slightly retarded growth rate. Sunshine promotes normal feathering, and turkeys of all ages should have direct access to it whenever possible.

STAMPEDING

Turkeys are subject to fright at night, especially on moonlit nights. Severe losses from injury, straying, smothering, bruising, broken limbs, and deaths by predatory animals may result from stampedes. To prevent stampeding, avoid disturbances of all kinds around the roosting quarters and provide night lighting by electricity, preferably a rotating beam, or by cannonball flares. In large roosting sheds, wire or slat partitions should divide the quarters into relatively small sections to hold not over 200 birds, which will minimize losses if stampedes occur. Woven wire on top of or nailed to the undersides of the perches is helpful in preventing serious damage as a result of stampedes. Occasional low-flying airplanes may cause serious stampedes.

MARKETING TURKEYS

The marketing season for the bulk of the turkey crop usually is comparatively short, extending from early November through late December. However, there is an increasing demand in the winter and late summer for fresh roasting turkeys and a year-round market seems likely to be developed soon. Many turkey raisers sell their birds alive to poultry dealers who either dress them or ship them alive to city markets. In sections where turkeys are grown in large numbers, dressing plants have been built by cooperative associations or by poultry processors who collect the live birds and dress them for market. As soon as possible after reaching the dressing plant, tur-

keys are killed, picked, cooled, and packed in boxes or barrels for shipment.

Farmers near city markets often dress their turkeys and sell them direct either to the consumer or to city retail dealers. In territory adjacent to large cities, marketing of both live and dressed birds at roadside markets has become common. Some growers have developed profitable gift-package businesses, delivering by truck, express, or parcel post. The dressed turkeys are shipped in sealed packages containing dry ice—about 1 ounce per pound of turkey.

Turkeys that are eviscerated and prepared for the oven, sometimes stuffed with dressing, are a new development that has helped to popularize turkey meat. Cutting large turkeys into halves, quarters, and steaks is opening up new retail outlets; likewise the raising of more small-type turkeys.

WHEN TO MARKET

Experiments with standardbred and Broad Broasted Bronze turkeys have shown that well-fed young birds of these varieties are marketed to best advantage at ages ranging from 26 to 30 weeks, the average being 28 weeks. Under the most favorable conditions, hen turkeys of these varieties may be ready for market as early as 24 weeks and the toms at 26 weeks. However, many are marketed at 24 to 26 weeks that are somewhat deficient in fat and possess numerous short pinfeathers. In general, if turkeys are kept longer than 30 weeks, the cost of further gains and the extra labor for their care causes the cost of production to rise rapidly. However, the extra price received for exceptionally well-fattened birds, or a price level well above cost of production, often justifies keeping the birds beyond the usual market age. Small-type varieties usually are ready for market at 22 to 26 weeks of age. As with the larger varieties, conditions of rearing may affect the time required to produce market birds. Cool weather during the later growth stages tends to speed up growth and subsequent maturity in all types of turkeys. Turkeys raised in confinement may require about 2 weeks longer than range-reared birds; but this is not necessarily true, since confinement-reared turkeys, if provided with a complete diet, ample room, and well-designed equipment, will mature at the normal age. The feeding of fresh-cut green feeds or some other source of extra vitamins to supplement ordinary growing diets produces normal growth and maturity in confinement. The earlier the birds mature, the lower is the cost of production; but it usually is not economical to market unfinished birds because of lower price received and the bad effect on the markets.

SELECTING TURKEYS FOR MARKET

If rearing conditions have been satisfactory, the inspection of a few representative birds will serve to tell whether or not the flock as a whole is ready for market at the usual age. Under most conditions, it is important to market only turkeys that are fat and free from short, unpickable pinfeathers. To determine market quality, have the bird suspended by the legs and examine the skin around the shoulders, over the breast, and on the drumsticks for presence of pinfeathers too short to be cleanly picked without leaving a deposit of feather pig-

ment in the skin. If noticeable numbers of these short pinfeathers are present, the bird will not pick clean.

Next, pull a few feathers from the breast at a point about half way between the front end of the keel and the shoulder, between the two feather tracts of the breast. Take a roll of skin between thumbs and forefingers of both hands and examine for thickness and coloration. On a well-fattened, U. S. Grade A, turkey, the skin in this particular place will be white or yellowish white in color and have considerable thickness about equal to that of a piece of blotting paper. Extra well-fattened birds will have a thick skin, while under-fattened birds will have a thin, often paper-thin, skin which will be semitransparent, allowing the reddish flesh color to show.

Defects due to injuries before and after the birds are killed are common and cause loss of grade. Great care should be taken not to allow the birds to bruise themselves by flying or running against obstructions or by piling and trampling each other. The use of a catching chute or a small catching pen is recommended. A strong catching hook is useful. Care must be taken to avoid piling. Good picking methods obviously are important in producing high-quality dressed turkeys.

PREPARING TURKEYS FOR SLAUGHTER

Dressed birds with feed in their crops are not permitted in U. S. graded turkeys. However, feed may be removed from the crop of dressed birds by the water-pressure decropper, which is merely a hose with a long slender nozzle that can be inserted down into the bird's crop via the throat. Feed left in the crop of dressed turkeys spoils readily and detracts from the appearance of the carcass. Marketing agencies have different requirements regarding feed in the crop and these requirements should be ascertained before the birds are delivered.

Ground feed passes out of the crop quickly so that the crops will be empty if the mash is removed at dusk on the day before slaughter and if no grain is fed on that day. If the birds are kept without feed for more than 18 or 20 hours, they are likely to eat soil, litter, droppings, or feathers, and thus defeat the main purpose of withholding feed. This applies especially to adult stock. If the turkeys are not to be killed until late afternoon or evening, they should have a feeding of *mash* early in the morning. Grain should not be fed within about 18 hours of slaughtering. Feed should never be withheld more than 24 hours. All birds being held for slaughter should have free access to water up to time of killing. Where turkeys are marketed alive, the producer usually is not required to fast his birds.

KILLING AND PICKING ³

When the bird is to be killed, hang it up by the feet, in a strong metal shackle or by a strong cord passed through a hole in the center of a block of wood 2 inches square. Hold its head in one hand, the fingers grasping the sides, but not the front, of the head and neck over

³ Detailed information on killing, grading, and marketing turkeys is given in Farmers' Bulletins 1694, Dressing and Packing Turkeys for Market; and 1815 (revised 1949), Grading Dressed Turkeys, issued by the U. S. Department of Agriculture.

the angle of the jaws taking care not to compress the veins located in the forward part of the neck. Hold the mouth open and cut the jugular veins far back in the throat just below the base of the skull. Make one or two slanting cuts in such a manner that the blood gushes forth freely. For this purpose use the point of a sharp narrow knife with a straight blade about 4 inches long. As soon as profuse bleeding is established, thrust the knife backward at an angle corresponding with that of the upper beak through the groove in the roof of the mouth and into the rear lobe of the brain at the back of the skull, rotate the point of the knife to destroy sufficient brain tissue to obtain the desired result of loosening the feathers. When the correct "stick" is obtained, the bird usually gives a peculiar squawk, the tail feathers spread, and all the feathers are loosened accompanied by a quivering of the muscles.

An effect similar to that of sticking can be obtained by a sharp blow with a heavy club on the rear bulge of the skull which houses the portion of the brain that controls the muscles that release the feathers. After sticking, continue to hold the bird's head and attach a blood cup to the lower jaw. The bird's wings never should be locked, as this often results in broken wing bones causing a loss of grade. Likewise, no attempt should be made to hold the bird's wings tightly. Usually the operator reaches up under the bird and allows the wings to flop freely. For large birds, blood cups weighing 7 pounds are needed; for small and medium-sized birds 4- to 5-pound cups. Throat cutting only is practiced in many picking plants as a very good bleed is thus obtained. The birds then are slack-scalded.

Plucking is done by the dry or wet method. In dry picking, the turkeys are bled and stuck as directed above and plucking started at once. First remove the tail and large wing feathers, then the leg, back, and body feathers, leaving the breast, wing, and neck feathers until last. Pull out the feathers with brisk movements, not too many at a time, and do not try to loosen them by rubbing as this injures the skin and lowers the grade.

The slack- or semi-scald method of picking is in almost universal use in commercial dressing plants and is becoming popular for home dressing although a good share of home-dressed turkeys are dry-picked since it sometimes is difficult to obtain proper conditions at home for the practical operation of slack-scald equipment. Slack scalding is much faster than dry picking. In slack scalding, circular sheet-metal killing funnels which hold the bird without damage to it and allow the head to protrude from the bottom are very useful. For turkeys up to about 17 pounds of live weight the funnel should be about 22 inches long, 12 inches in diameter at the top, and 5 inches in diameter at the bottom; for birds over 17 pounds, a good size is 30 by 15 by 6 inches. The turkeys first are bled and sometimes also stuck, allowed to finish flopping, then immersed and agitated for 30 to 40 seconds in water heated to 126° to 128° F. or for 1 to 1½ minutes in 124° water. These temperatures and time limits must be observed carefully. The birds are then picked by hand, by mechanical pickers, or are dipped in melted wax held at 124° F., which is then cooled so that the wax may be removed in sheets along with the feathers. When wax picking is practiced, about 75 percent of the feathers are removed by hand before the wax is applied, leaving a scattering of feathers all

over the body, including all pinfeathers. Wax picking is not suited to home operations and even in packing plants is being replaced by mechanical pickers, which if properly operated, remove all feathers very efficiently without serious damage to the skin. Efficient machines for removing the body feathers and other machines for removing the large and small wing feathers now are obtainable.

Clean-picked turkeys are preferred on the market. No fan feathers (the primary coverts) are permitted in the U. S. grades. All feathers should be removed except those that will be covered by the headwrap. Remove all pinfeathers, especially from the breast, but do not attempt to dig out pinfeathers too short to be pulled as this causes more damage than the pinfeathers. White, Buff, Royal Palm, and to a lesser extent, Slate and Bourbon Red turkeys have pinfeathers that are not conspicuous, hence the birds dress out well. After picking, snap the blood from the bird's mouth with a quick slapping motion and squeeze the area to the front of the vent to remove any droppings that may be in the cloaca. The feet, if dirty, should be wiped clean or washed and dried. Dirty feet should be prevented by keeping the birds out of droppings and mud prior to slaughter. These methods make for clean carcasses, high market grade, and good keeping quality. After all blood has drained from the carcass, headwraps should be applied. Headwraps should be made of heavy waxed paper and applied in such a manner that they will not come off.

Where necessary, crops and their contents may be removed. Through a small slit in the side or back of the neck, beginning where the neck joins the body, the crop can be completely loosened and withdrawn, the gullet being cut well below the crop and well above it so that the contents do not contaminate the flesh of the bird. U. S. grades do not permit sewn skin. If crop contents are liquid, they may be removed by milking the crop, while the bird is alive or freshly killed. The best method of removing crop contents is to wash them out with water pressure, as mentioned previously.

Overnight withholding of feed results in a loss of about 3 percent of the live field weight of birds on full feed. Killing and picking results, on the average, in a loss of about 9 percent of the fasted live weight of Broad Breasted Bronze hens and toms; about 10 percent in standardbred Bronze and the larger strains of the other standardbred varieties; and 11½ percent in small varieties and average- or small-sized strains of the other standardbred varieties. During chilling, the weight loss is negligible being only about one-sixth of 1 percent of the dressed weight. The average loss, therefore, from live field weight to a dressed and chilled condition averages about 12 percent for Broad Breasted Bronze, 13 percent for standardbred Bronze, and large strains of other standard varieties, and 14½ percent for small- and medium-type turkeys. When dressed turkeys are drawn (head, feet, entrails, and oil gland removed, but the giblets, loose fat, and entire neck to its junction with the head at one end and the body at the other returned to the carcass) there is a loss of about 13 percent of the dressed weight of Broad Breasted Bronze, and 15 percent of other varieties. The New York dressed carcass (blood and feathers removed) contains about 10 percent of bone and about 46 percent of raw lean meat in all except Broad Breasted Bronze, which contains about 52 percent raw lean meat. These figures apply to well-fattened roasting turkeys of average conformation for the variety.

COOLING

Hanging the birds by their legs for 12 hours or more, or laying them on their backs where the temperature of the air ranges from 30° to 36° F. will properly chill the carcasses intended for marketing through usual trade channels. For local consumption not involving long holding periods, chilling temperatures as high as 45° are satisfactory, though lower temperatures are desirable. Freezing the birds solidly is not desirable since the rigid condition prevents efficient handling and packing. Turkeys always should be chilled prior to freezing. In mild weather, it is not possible to cool the carcasses properly without the use of refrigeration or ice water. Slack-scalded carcasses usually are cooled in water; dry-picked birds in air. An ordinary dairy thermometer inserted well into the vent will indicate the status of the cooling. It is important that the bird be chilled completely through.

PACKING

Boxes or barrels are used for packing dressed turkeys. Packing in barrels lined with waxed or plain kraft paper, while easier and slightly cheaper, is not so satisfactory as box packing, although it is often the most practical method to use for small shippers.

Single-layer boxes which hold from 6 to 14 birds generally are used by commercial concerns. Boxes having inside dimensions of about $30 \times 22 \times 8\frac{1}{2}$ inches are often used, though the size may vary. With these boxes, small birds are packed breast up, while larger birds are slanted so that they come to the top of the box. Extremely large birds are laid flat.

In barrel packing, line the barrel preferably with waxed paper and lay the birds on their sides, backs against the sides of the barrel. If birds of different sizes are packed in the same barrel, place the larger birds on the bottom. When the barrel is full, turn in the paper to cover the birds, take off the top hoop, place a piece of clean cloth or burlap over the top and replace the hoop over the burlap, nailing it down.

Boxes, barrels, or other containers should be free from objectionable odor as the turkey meat may absorb it. Only New York dressed birds may be shipped without freezing; eviscerated or ready-to-cook turkeys must be wrapped with waterproof material and frozen within a few hours after processing.

There is considerable risk for the producer who does not have access to proper refrigerating facilities in shipping dressed turkeys during mild weather. If the birds are to be sold in mild weather, it is safest to market them alive or sell them dressed to local purchasers for immediate consumption. It also may be feasible in some situations to chill the dressed birds in ice water and pack them in barrels with layers of cracked ice in each end of the barrel. This procedure is satisfactory only for relatively short shipments. In any case, the internal temperature of the turkeys should be reduced to a maximum of 36° F. before they are shipped.

GRADING DRESSED TURKEYS

Grading programs for dressed turkeys differ somewhat in the various markets, but in general are similar. Greatest uniformity is pro-

vided where the U. S. Standards and Grades are used. The U. S. grading program is intended to satisfy the demand of consumers more fully and to promote more uniform grading, removed from the influence of supply and demand and the idiosyncrasies of individual buyers.

The U. S. Government grading program is administered by the Production and Marketing Administration of the United States Department of Agriculture. Under this, there are three grades of dressed turkeys: U. S. Grade A, formerly Prime; U. S. Grade B, formerly Choice; U. S. Grade C, formerly Commercial. Each grade is divided into five classes, based on age and sex of the bird. These classes are: Fryer Turkey, Young Hen, Young Tom, Mature (old) Hen, and Mature (old) Tom. The quality specifications for individual birds apply to each class with due allowance for fleshing condition characteristic of sex and age. Detailed descriptions are provided for each grade, but in general, no U. S. graded turkeys may have feed in the crop, dirty feet or vent, dirty or bloody head or body, any evidence of unwholesomeness, or any feathers except those under the headwrap.

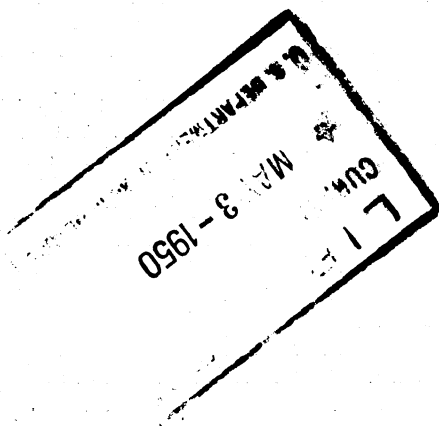
For the A Quality or Grade, it is required that the bird be well-fleshed, well covered with fat all over the body, well-dressed, well-bled, and practically free from pinfeathers, especially on the breast, but may have slight imperfections, such as slight flesh or skin bruises, abrasions, and discolorations, the breast being practically free from defects. Broken wing tips and one disjointed but not broken wing or leg and slightly curved and slightly dented breast bone (dents not to exceed one-fourth inch in depth) are permitted. It may have no open skin tears on breast or legs, but elsewhere it is permitted two, not exceeding $1\frac{1}{2}$ inches in length. Sewn skin tears are not permitted anywhere. It may be slightly staggy, may have blueback on tail only, may have crop removed from the back of the neck with the small opening left open, slightly curved breast bone (one that does not interfere with slicing), very slight marks of freezing, so slight as not to affect the quality of the flesh, breast calluses and blisters not over an inch long, and no headwrap is necessary if ice-packed.

For B Quality or Grade, a turkey must have a fairly well-fleshed breast and a carcass fairly well covered with fat. The bird may be only fairly well-bled and dressed, and may have fairly numerous skin abrasions and discolorations, with scattered pinfeathers over all the carcass. It may have slight flesh or skin bruises not more than one-half inch in diameter and not more than three in number on the breast, or one broken leg or wing. Breastbone may be rather deeply dented and/or slightly crooked and there may be breast calluses and blisters not over 3 inches long nor too dark in color, and blueback, provided it does not extend further than over the hips. Unsewn torn skin is permitted on breast if tears are not over 1 inch long, and three open tears are permitted elsewhere if less than 2 inches long. Dry scaly spots all over the carcass or other marked effects of freezing are not permitted.

Turkeys not meeting these grade requirements, including birds poorly fleshed, poorly fattened, covered with pinfeathers, showing marked effects of freezing, poorly bled, badly deformed, possessing numerous skin abrasions and discolorations, having large open tears over 2 inches long or more than one tear over 1 inch long on the breast,

bad bruises, and broken bones may be placed in C Quality or Grade. Birds with serious defects and deformities are allowed in C Quality only if they are otherwise of B Quality or better. The requirements concerning feed in the crop are the same as for A and B Quality.

Other systems of grading are in common use. In these, only two, or rarely three grades are used. The No. 1 or top grade usually consists of young toms and young and old hens which are well fleshed, well fattened, and free from serious tears, bruises, and severely crooked breastbones. The crops must be empty and the carcasses reasonably free from pinfeathers and reasonably well bled. No. 1 turkeys include birds that would be A Quality or Grade in the U. S. Specifications for Standards and Grades. The No. 2 grade includes all old toms and such young toms, young hens, and old hens that do not meet the requirements for the No. 1 grade, including specifically, turkeys with severely crooked breast bones, broken wings, bad blemishes, bad tears, bad abrasions, feed in crops, numerous pinfeathers, and birds that have been poorly bled or are poorly fleshed or fattened. The No. 3 grade, where used, includes birds not good enough for No. 2, but still fit for food. These are culls that never should have reached the market. The No. 3 grade is not often used, since turkeys of this quality are more often rejected by the buyers. On some markets, a medium grade of bird—between No. 1 and No. 2 grades—and corresponding to U. S. Grade B—is used. More often, however, these medium-grade birds are classified as No. 1 when demand is good and as No. 2 when demand is poor.



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